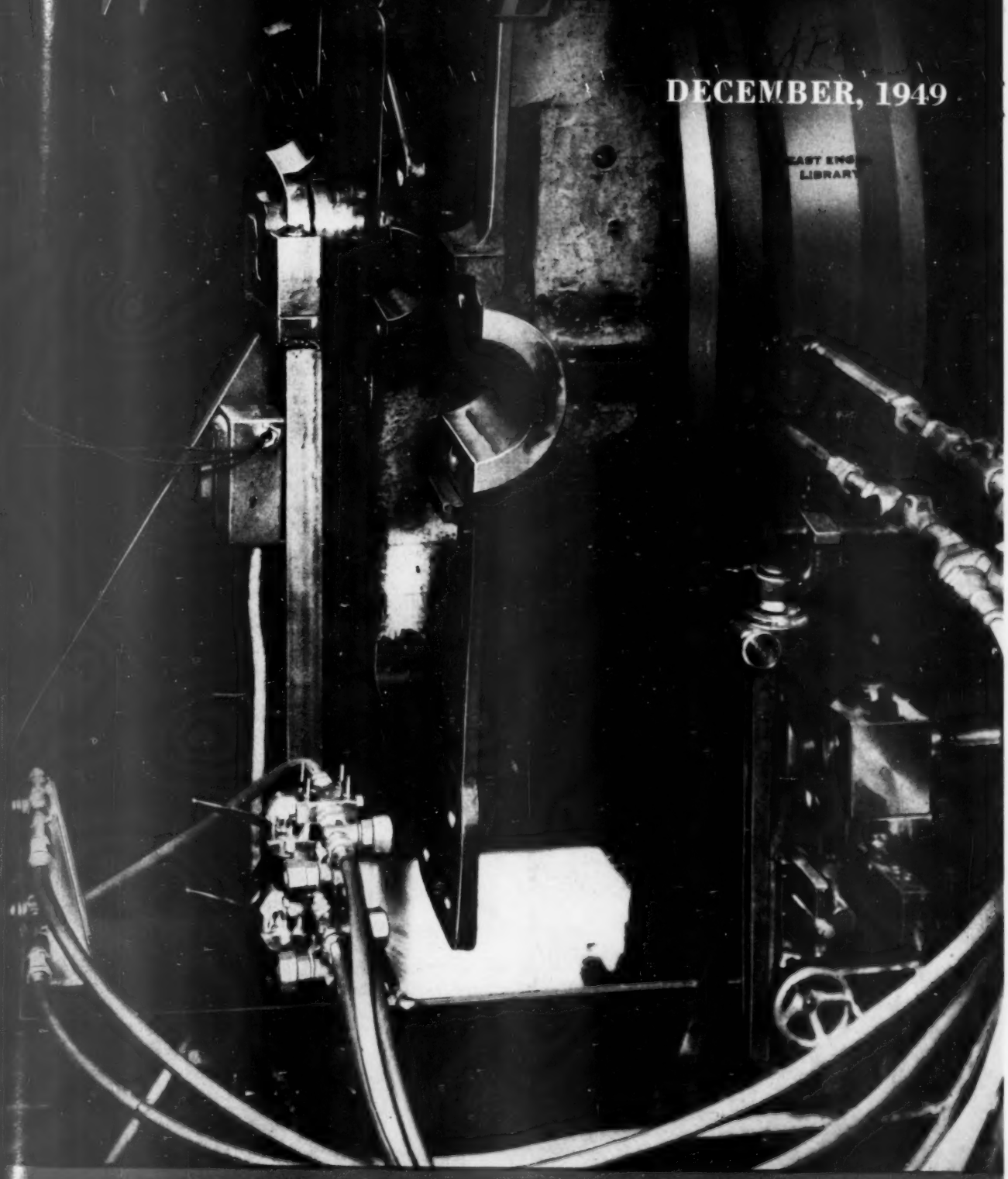
WELDING ENGINEER

DECEMBER, 1949



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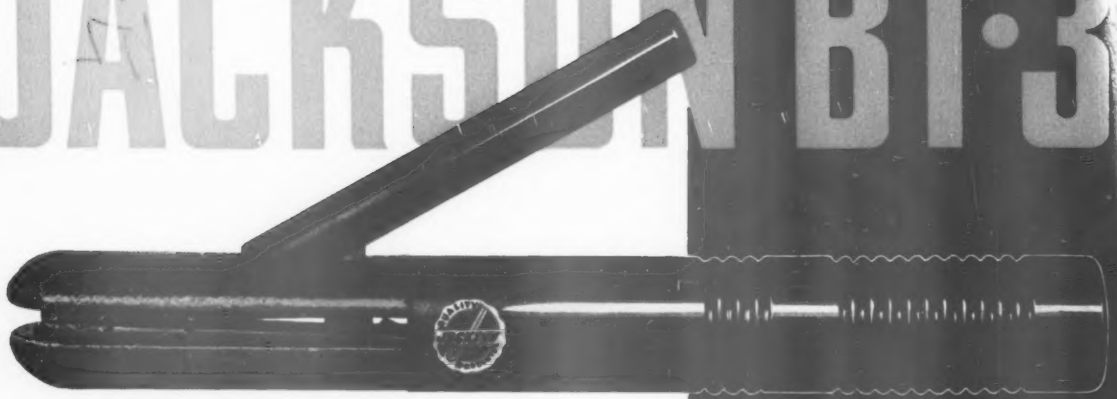

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THE WELDING ENGINEER, *with which is combined The Acetylene Journal*

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Volume 34 - Number 12 December, 1949

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COVER: *Flame-hardening roller pads on a 3,400-lb lower frame casting for a steam shovel. Both faces of each pad are done 4 in. wide and have a 57½-in. mean diameter—a total area of 1,440 sq in. on each pad to be hardened to a 3/32-in. depth. Photo courtesy Pittsburgh Metal Processing Co., Inc.*

Convention

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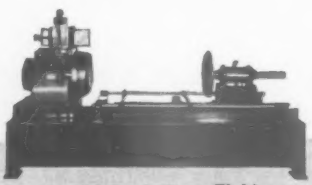
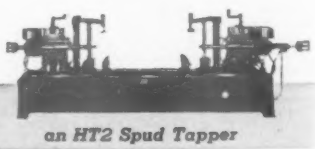


the G2 Girth Seam Welder



an HT2 Spud Tapper

ESTABLISHED 1916 THE WELDING ENGINEER DECEMBER, 1949

What's the Welding Problem

RECENTLY, after a talk before an engineering group, one of my audience asked me, "If welding is as good and as important as you have led us to believe, why isn't it used more extensively?"

It wasn't a difficult question, for the answer is simply, "Not enough people in the management, engineering or customer group know enough about welding to demand welded products."

Maybe the answer was an indictment of those who have been trying to sell welding, but nevertheless it is true—people are simply not aware of the importance of the 43 welding and related processes to their everyday existence.

Not too long ago an executive of one of our largest automobile companies tried to prove to me that welding meant nothing to the automotive industry. This statement seems ridiculous in view of the thousands of pieces of welding equipment in automotive plants. He backed up his opinion, however, with the information that there was only $13 worth of welding in a six-passenger, four-door sedan retailing at $2,000. He nearly had me stumped for a comeback until I asked, "What would this sedan cost if it were not welded?"

Since the plant had never tried to build the sedan unwelded, there wasn't any accurate answer. It was estimated, however, the auto might cost at least $1,000 more to manufacture. If welding saves $987 in the manufacturing cost of one automobile, you may rest assured that it *is* important to the automotive industry.

At this writing, we have been in the grips of a coal strike for nearly seven weeks, also a steel strike, and industry is slowly grinding to a standstill because of the lack of these materials for metalworking production. But industry would have come to a standstill long ago if all welding had been taken away from us for seven weeks. With 87% of the metals industry using welding for maintenance purposes, it is easy to see the importance of welding in keeping our metal producing and fabricating plants in operation.

But management is not aware of welding's vital role in keeping the wheels of industry turning.

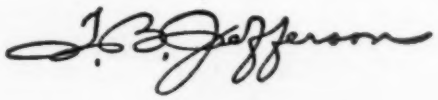
The biggest problem facing welding men is to disseminate knowledge: to let the other fellow know just how much welding means to each and everyone of us. . . how it has put the modern automobile within the reach of millions . . . has made possible the modern airplane . . . given us stills and cracking towers for high-octane gasoline. . . enabled us to build more ships in less time than the world had heretofore known.

Welding has given everyone in the United States a lot of things to make life more enjoyable. It is up to us to tell the story to our friends and neighbors so that more people will become aware of welding.

Undoubtedly, there would be a greater genuine appreciation of the processes if the general public became aware that the skyscrapers being built in some cities are growing silently because they are welded instead of riveted. Just think how much time is lost because of the eternal racket that construction activities often set up in our large metropolitan centers! That's just one instance that could be included in our story.

The biggest problem facing welding men today is to sell the general public. We haven't done a good public relations job, but we could. If everyone in the industry would start thinking along the lines I've indicated, the results would be truly amazing.

Let's really start to solve this problem.



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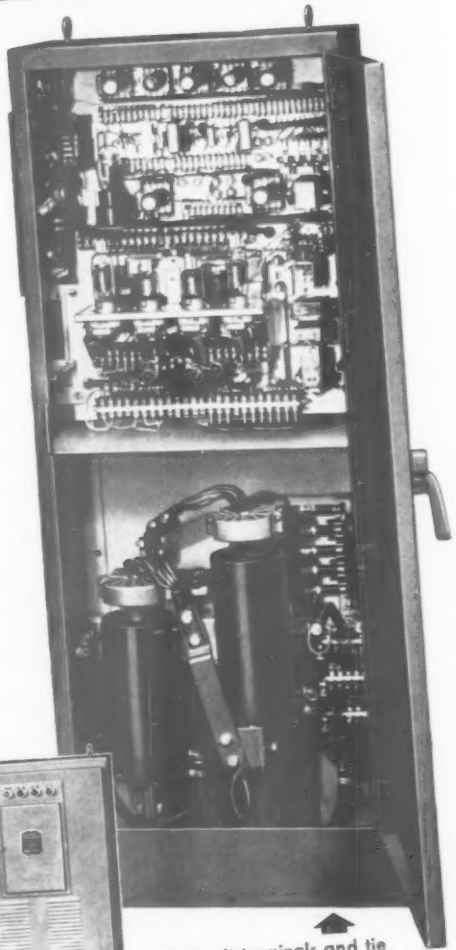

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Class 8993 controller can be arranged either for side of machine mounting or wall mounting.

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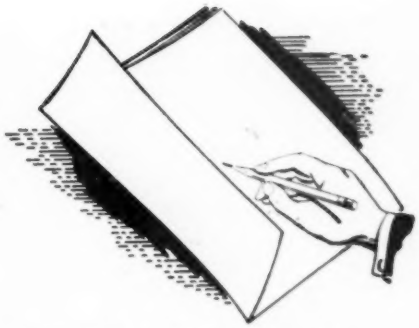
Convention Notebook

Total registration of over 1,800 made this the best-attended AWS convention held in 30 years. Its 78 technical papers unveiled no spectacular new developments but did show plenty of progress



BY CLYDE B. CLASON

KUDOS to Cleveland as host to the 30th annual meeting of the American Welding Society! Few cities are so pleasant to visit, and few so exert themselves to entertain. From Monday through Friday, Oct. 17-21, this was a highly enjoyable convention. Technical sessions were well planned and ran smoothly. As for the lighter side—well, who will be able to forget Mike Shane in a smock presiding as master of ceremonies at the combined president's reception and annual dinner?

A total registration in excess of 1,800 made this the best-attended convention the Society has ever held. Chairman M. S. Shane and his hard-working cohorts of the 1949 Convention Committee deserve a world of credit for the success of this good gathering.

Awards and Prizes

Monday evening witnessed the awarding of prizes and medals and the 1949 Adams Lecture. Retiring President George N. Sieger presided over this important session, aided by M. S. Shane as co-chairman. First prizes to be bestowed were to the winners of the 1949 Resistance Welder Manufacturers Association prize contest for outstanding papers dealing with resistance welding.

Julius Heuschkel and H. C. Bitzer, Westinghouse Electric Corp., East Pittsburgh, won the first prize of $750 for the best paper from an industrial source with their paper, "Spot-Weld Consistency Studies." Mr. Heuschkel is manager of the Westinghouse research welding section, and Mr. Bitzer has been laboratory assistant in the Westinghouse research welding section since returning from the Navy.

Ivar W. Johnson, General Electric Co., Schenectady, won second prize of $500 for a paper entitled "Slope Control and Its Effect on Spot and Projection Welding." Mr. Johnson is in charge of resistance-welding development work in the Schenectady works laboratory. Third prize of $250 was won by F. G. Harkins, welding engineer, Solar Aircraft Co., San Diego, Calif., for an article on the "Spot Welding of Nickel and Nickel Alloys in Dissimilar Metal Combinations."

As usual, the young scientists of Rensselaer Polytechnic Institute, Troy, N. Y., walked away with all the honors for papers from a university source. First prize of $300 was awarded to R. M. Curran, P. Patriarca and W. F. Hess for their paper on "Optimum Flash-Welding Conditions," and second prize of $200 to W. J. Childs, R. F. Underhill, Jr., and W. F. Hess for the second-best paper, "Further Studies in Projection Welding." Since Dr. Hess has experienced an unfortunate heart attack and was unable to attend the convention, both awards were accepted in his behalf by Dr. Ernest F. Nippes of R.P.I.

A. G. Bissell, civilian head, welding and metals branch, Bureau of Ships, Navy Department, was selected as the recipient of the 1949 Samuel Wylie Miller Memorial Medal, awarded each year for "conspicuous contributions to the welding or cutting of metals." The presentation was made by Rear Admiral Ellis Reed-Hill, of the U. S. Coast Guard.

A. Amirikian, head engineer, Bureau of Yards and Docks, Navy Department, was awarded the 1949 Lincoln Gold Medal for his paper, "Future Developments in Welded Steel Buildings." Mr. Amirikian has for the past ten years been heading the Bureau's special design section on buildings, welding, floating structures and protective construction.

In the A. F. Davis Undergraduate Welding Awards, the first prize of $200 went to James B. Snider, Jr., Agricultural and Mechanical College of Texas, College Station, Tex., for a paper, "The Atomic and Crystalline Structure of Metals," published in the *Texas A & M Engineer*, which also received a $200 cash award.

Second prize of $150 was won by David S. Wise, University of Michigan, for his paper, "Electrical Welding in Conjunction with the Briquetting Process." The *Michigan Technic* was presented with a $150 prize for publishing this article.

Adams Lecture Excellent

Unlike some past performers, the 1949 Adams lecturer was brief and wholly understandable. W. M. Wilson, research professor of structural engineering, University of Illinois, was selected for this honor. Professor Wilson is widely known for his work in the field of structural engineering and has made outstanding contributions to engineering knowledge relative to the design of bridges and to the design of riveted and welded joints in steel structures. His subject was: "The Advantages and Disadvantages of Arc Welding as a Means of Fabricating Steel Structures."

The factors favorable to fabrication by arc welding are: greater economy of design, smaller investment in equipment, greater ease of fabrication for some structures and greater possibilities for architectural treatment. These advantages are all too well known to require much comment. On the negative side, the unfavorable factors are: (1) the possibility that some welds may be inferior, (2) insufficient knowledge relative to fatigue strength of welded joints, (3) undesirable properties of metal in the weld and heated base metal.

Proper design, proper welding procedure, properly qualified welders working under proper supervision and inspection can greatly minimize the first and third of these disadvantages, Professor Wilson admitted. On the other hand, there is a need for more and larger programs

Prize Winners . . .

A. G. BISSELL
Samuel Wylie Miller Medal

ARSHAM AMIRIKIAN
1949 Lincoln Gold Metal

JULIUS HEUSCHKEL
$750 first prize, RWMA

H. C. BITZER
$750 first prize, RWMA

of fatigue testing welded structural joints. Since fatigue failure is a disease of old age, it is as impossible to predict in advance that it will or will not occur as for a young man of 20 to boast that he will never have rheumatism because he has hitherto been free from the symptoms. Not a single welded bridge has been in service long enough for its record of no fatigue cracks to be of any significance, the lecturer asserted. On the other hand, some 400 fatigue cracks have been discovered in riveted members of steel bridges.

Educational Lecture Series

The educational lecture series, inaugurated last year at the Philadelphia convention, was continued with three afternoon lectures given by Harry W. Pierce, assistant to the president of the New York Shipbuilding Corp. Mr. Pierce discussed the problems of designing for welding. In his first lecture on Monday afternoon, he pointed out the eight factors which eventually determine whether a design should be fabricated by welding or otherwise. These factors are: (1) form of product; (2) material to use; (3) weight limitations; (4) time (overall calendar period for building); (5) shop facilities; (6) quantity to be built; (7) final appearance; (8) cost.

The lectures on Tuesday and Wednesday afternoons considered these eight points in specific detail. As Mr. Pierce pointed out, proper consideration of all of the above factors will often, though not always, lead to a welded design. In spite of the fact that these lectures were at the Public Auditorium, some blocks away from the Hotel Cleveland where the technical sessions were being held, the average attendance was around 100.

Witty Keynote Address

Another special lecturer rating every good thing that can be said about him is Dr. Philip W. Swain, chief editor of *Power* and of *Operating Engineer*, who delivered the keynote address at a special session on Thursday evening. Dr. Swain's wit held your reporter so spellbound that he forgot all about taking notes until the lecture was half over. There is nobody who can do a better job of reducing technical engineering problems to simple human terms than Phil Swain. He is a master of "plain talk," an art which has been seemingly much neglected.

Dr. Swain's subject was "The Importance of Welding: to Management, the Engineer and the Public," but this theme was of less importance than the variations played upon it. Dr. Swain deprecated a highbrow, for instance, as "a man who has discovered some subject more interesting than women," and defined a hole as "nothing surrounded by what would be in the hole if the hole wasn't there." In a more serious vein, he brought out the astounding fact that arc welding alone annually consumes an amount of energy equivalent to that released by 56 atomic bombs. If resistance welding and gas welding are to be added, the annual requirements of the welding industry in the United States are probably equal to a hundred atom bombs. Yet one atomic bomb releases 25,000,000 kwh, an amount of energy which would cost you a quarter of a million dollars if you were to be billed for it at the rather low rate of 1c per kwh.

The keynote speaker was introduced by J. F. Lincoln, president of The Lincoln Electric Co., who had some good points of his own to bring out. Why, Mr. Lincoln wanted to know, should porosity be allowable in castings but not in the welds that join them together? Why is X-ray inspection required on welded joints but not on riveted joints designed for the same service? If an airplane can get by with a safety factor of two, why does a boiler require a safety factor of six?

Plant Inspection Tours

Orchids must go to J. F. Wagner, of Burdett Oxygen Co., who as chairman of the plant visitation committee arranged the Thursday afternoon tours to plants of the Cleveland Electric Illuminating Co. and the Fruehauf Trailer Co. Both plants are located at Avon Lake, a western suburb of Cleveland. A sunny October afternoon and a pleasant ride along the lake front provided a perfect background for the trip.

At Fruehauf, the visiting AWS men were taken on an inspection tour of a building 2,259 ft long and 405 ft wide, the largest building in the world devoted exclusively to truck-trailer manufacture. Over 50 production stations were visited during the hour-and-a-half walk around this huge factory. Arc welding is used

IVAR W. JOHNSON
$500 second prize, RWMA

FRANK G. HARKINS
$250 third prize, RWMA

DR. WENDELL F. HESS
1st-2nd, RWMA, University

PROF. W. M. WILSON
Delivered Adams Lecture

to great extent in the fabrication of the chassis and body skeleton, while attachment of the side and roof panels is done by spot welding. A newly installed multiple spot welder makes 28 welds at a time to join Z-bars of ⅛-in. high-tensile alloy to 20-gauge sheets. The bars are spaced about 8 in. apart, but the machine indexes every 2¼ in. to make spots at the outer edges of the sheets. Whenever a new bar appears under the welding head, all 28 electrodes come down.

Capacity of this well-tooled plant is 100 trailers a day, but production has been cut to 22 units a day because of the steel strike.

The Avon power plant is one of three interconnected generating stations operated by The Cleveland Electric Illuminating Co. Two new 90,000-kw turbogenerators are due to go into service in the immediate future, raising the plant's generating capacity to 400,000 kw. The expansion project also requires the construction of a 1,000-ton-per-hr coal handling system to serve both the new and old sections, two 850,000-lb-per-hr boiler units and reinforced concrete tunnels capable of handling up to 1,000,000 gallons of condenser cooling water every minute. The visitors gaped upward at walls of boiler tubes seemingly on the scale of Zion Canyon, peered downward at coal bunkers deeper than the bottomless pit at Carlsbad and just for good measure were given a peep through an inspection door of the furnace into flames hot as any heat that hell is capable of producing.

On the facts-and-figures side, it is interesting to note that 90% of all of the pipe connections necessitated by the new additions are welded connections. As many as 40 weldors were engaged at one time in this extensive pipe work. Steam is generated at a pressure of 890 psi and a temperature of 950 F at the superheater outlet. A 16%-chromium piping is used to contain the superheated high-pressure steam, and this involved special welding procedures. Each joint was preheated to 500 F by means of induction-heating coils and stress relieved at 1,300 F.

Business Meeting

The year's activities of the American Welding Society were summarized by Retiring President Sieger at the business meeting on Wednesday afternoon. The Society has succeeded in nearly holding its past year's total membership, he pointed out, but has not realized the anticipated substantial gains in member numbers nor the added volume of paid advertising expected for *The Welding Journal*. The third edition of the *Welding Handbook* is now almost ready for distribution and a redesigned Year Book and Membership Directory has been produced as well as a revised *Welding Metallurgy* book rewritten in a style acceptable to the shopman, the engineer and the metallurgist—no easy task. Also the Society's national educational committee submitted a "Definition of a Welding Engineer" and a "Definition of Welding Engineering" which have been unanimously approved by the board of directors.

Economics of the coming year were mentioned by Executive Secretary J. G. Magrath in his annual report. "We have had in the month of September, 1949, an opportunity to discuss the trend with several editors-in-chief of our largest metalworking publications," he said. "Their predictions run from 'cautiously optimistic' to 'optimistic' but the average expectation is for a 10% increase in advertiser insertion during the coming year over the past year. They believe that after another year we will be into an upswinging market that will be sustained for a long period. They feel that the strike potential will have little influence on the whole; that inventories have been reduced far beyond the 'necessity' standpoint; that purchasing power is strong although conservative."

Treasurer R. S. Donald reported that the operations for the year resulted in an excess of expense over income of approximately $22,000. Total income for the fiscal year aggregated $207,900, an increase of $22,800 over the previous year, but total expenses amounted to $230,000 as against $205,500 for the previous year. The majority of the increase in expense was caused by increased costs in publishing *The Welding Journal* and the costs of the membership drive.

O. B. J. Fraser, chairman of the national membership committee and newly elected president of the Society, discussed the membership situation in detail. During the 11-month period ending Aug. 31, 1949, the Society gained 1,440 new members and lost 1,642 members, a net loss of 202. On the credit side, however, new AWS sections were activated at Roanoke, Va.; Dallas, Tex.; Phoenix, Ariz., and Berwick, Pa., and a sec-

Convention Snapshots . . .

M. S. SHANE (left), chairman, Convention Committee, shakes hands with Tom Crawford, chairman, Detroit AWS

RAY TOWNSEND (left), district vice-president, J. G. Magrath, secretary, and H. O. Hill, past-president, AWS

tion-division at Olean, N. Y. Additional sections or section-divisions are also to be formed at Danville-Urbana, Ill., Hagerstown, Md.; Salt Lake City, Utah, and Richmond, Va., according to present plans.

Technical activities of the year, reviewed by C. H. Jennings, the newly elected second vice-president, included the completion of a new standard, "AWS-AWWA Recommended Practices for the Inspection, Repairing and Repainting of Elevated Water Storage Tanks, Standpipes and Reservoirs." Being investigated is the desirability of organizing two new technical committees—one on farm and earth-moving machinery and one on natural gas and oil pipe lines.

Boardman Heads W.R.C.

Harry Boardman, director of research of the Chicago Bridge & Iron Co., Chicago, will become the new chairman of the Welding Research Council. He succeeds Dr. Comfort A. Adams, who is retiring from a position he has held since the organization of the Welding Research Council in 1935. In the 14 years of its existence, the budget of the W.R.C. has increased from a very small beginning to approximately a quarter of a million dollars annually.

A vote of thanks to Dr. Adams was proposed by H. O. Hill, of Bethlehem Steel Co.

Also retiring is Miss Marguerite M. Kelly after 30 years of service as AWS secretary. A group of her old friends honored her on Wednesday noon with a surprise luncheon at the Hotel Cleveland. Miss Kelly has been designated "Secretary Emeritus" by the board of directors.

As reported in the October issue of The Welding Engineer, the Society's 1949-1950 officers are: O. B. J. Fraser, president; H. W. Pierce, vice-president; and C. H. Jennings, second vice-president. R. S. Donald continues as treasurer.

Technical Sessions

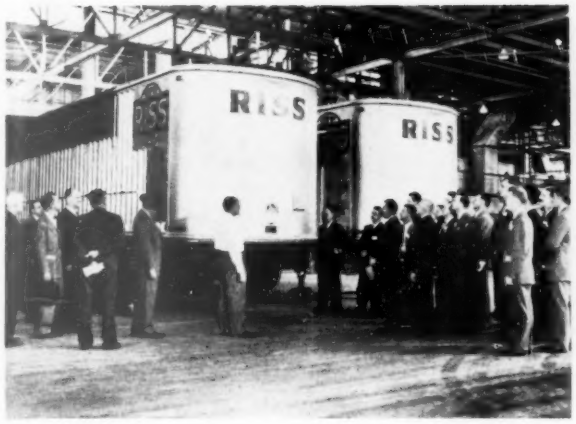
The bread-and-butter, meat-and-potatoes end of the convention was, of course, its 21 technical sessions. Your reporter would like to interject a personal comment. He has found it necessary to bring a pocket flashlight along to enable him to make notes while slides are being shown, and next year he is going to add to this equipment a pair of high-powered binoculars so that he will be able to read the figures on the slides. And he is not more nearsighted (with glasses on) than other people.

A total of 78 papers were given, and it is obviously impossible to review all of them without writing a full-size book. Since all papers were well done and all subjects were important, it's necessary to resort to grab-bag tactics and pull out a handful of names at random. Those whose papers aren't mentioned mustn't feel slighted any more than if they fail to win one of the prizes on Bank Night at the local movie house.

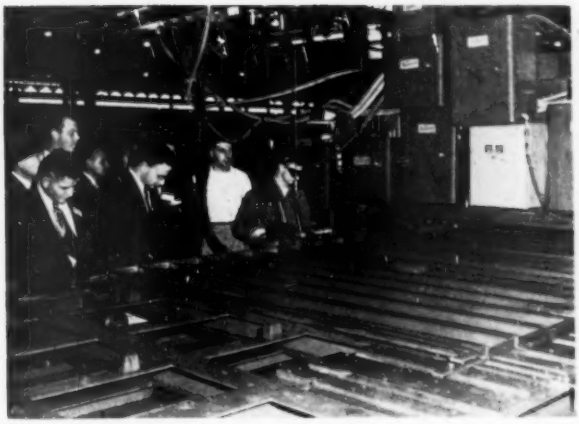
Design and construction of a modern welded deck girder highway bridge was covered by Ned L. Ashton, State University of Iowa. The bridge concerned is a two-lane highway bridge over the Iowa river at Iowa City, Ia. Among innovations mentioned were piles pointed with flame-cut and welded plates. Purpose of such pointing is to aid penetration of the pile through the river bottom and also to help keep it from collapsing when rock is reached. Other features of special interest are girders and floor systems of all-welded design, welded shoes with high-strength line bearings, welded tee stiffener arrangements, prefabricated handrail and curb sections, butt-welded field splices for both the main girders and the roadway stringers, all-welded expansion joints and welded reinforcing trusses.

That amiable gentleman, Consulting Engineer Martin P. Korn, told about a new type of subway frame he has originated, in which riveted bents are replaced with welded rigid frames fabricated by mass production of identical units. Savings by this design would aggregate approximately 40,000 tons of structural steel and more than $10,000,000 on the 240 track miles of the proposed Second Avenue subway, projected for early construction. A committee of subway engineers appointed by the New York City Board of Transportation to investigate the design has reported 100% in its favor.

In the pressure vessels session, A. J. Hopper, Welding Engineers, Inc.,



AWS VISITORS inspect finished trailers during their interesting trip through the Fruehauf Trailer factory



NEW MULTIPLE indexing spot welder welds Z-bars to side sheets to fabricate an entire side of a trailer

discussed some of the practical problems encountered in the welding of aluminum pressure vessels with plate thicknesses of from 3/16 to 2½ in. The material generally was of 3S aluminum alloy. Welding in all cases was done by the manual inert-arc process using argon gas. On all heavy plate, it was necessary to preheat the parent aluminum and hold a high temperature during welding. Hold-down jigs and fixtures were found to have considerable usefulness in controlling distortion.

Automatic Hard-Facing

A method of utilizing two automatic feeds on one head and thereby doubling operating efficiency was described by Turner G. Brashear, Jr., Leader Welding and Mfg. Co., Berkeley, Calif., in his paper on automatic electric hard-facing. The arc (under the flux) is between the two electrodes, which are connected in series. Penetration is better than with the conventional single-electrode head, and there is only a small degree of dilution of the hard-facing alloy with the parent metal. Voltage between the two electrodes is about twice normal—roughly 40 to 60 volts.

Hot hardnesses at 600 F, 800 F, 1,000 F and 1,200 F were surveyed by using a Rockwell diamond indentor technique, it was reported by Howard S. Avery, American Brake Shoe Co. Data are now available on some 35 materials, which include most of the types in the current AWS classification of hard-facing alloys. Some general points: Low-alloy steels with little resistance to tempering lose hardness rapidly. Alloys such as chromium, tungsten and molybdenum, which cause marked secondary hardening, contribute to good hardness retention up through 1,000 F. The chrome-cobalt-tungsten alloys generally exceed the other alloys in hardness at 1,200 F, but their properties vary widely with carbon content. The tungsten carbides are probably at the very top of the scale for hot hardness.

The welding of high-nickel alloys to other metals was the subject of an excellent paper by G. R. Pease and H. B. Bott, both of The International Nickel Co., Inc. They described a research in which over 70 test welds were made to join Monel, Inconel and commercial nickel to each other and to other materials including mild steel, 18-8 stainless steel, 70-30 cupronickel, silicon bronze and a proprietary wrought nickel-molybdenum alloy. In general, results indicated that the safest choice for welding is the electrode which matches the composition of the high-nickel alloy involved. Where two high-nickel alloys are concerned, either matching electrode is satisfactory.

Welding Molybdenum

The need for high-temperature materials to use on the exhausts of jet planes and rockets may help to create a demand for pure molybdenum, which melts at the phenomenally high temperature of 4,595 F. Other possible applications for pure moly are to be found in piping for acids and in resistance-welding tips. According to I. S. Goodman, Lamp Div., Westinghouse Electric Corp., arc welding is the least promising method of joining molybdenum sections; nevertheless, it appears to be the only non-mechanical method for joining large or thick sections so that the joint has properties comparable to the base metal. Some of the difficulties to solve are that molybdenum oxidizes very rapidly in the air above 400 C (752 F); in the range from 900-1,000 C (1,652-1,832 F) it recrystallizes and forms large grains of low tensile strength.

The method which would seem to offer the best potentialities for sound joints is the submerged-melt process, using pure moly rods for filler metal and d-c reverse polarity. Welds proved most satisfactory when amounts of nickel, iron and/or cobalt were added to the flux. Inert-arc welding was less promising than the submerged-melt process because of porosity and large grains. Neither was atomic-hydrogen welding satisfactory, and manual arc welding does not appear to be feasible.

Somewhat out of the ordinary was the special session on education held under the chairmanship of R. A. Wyant, Rensselaer Polytechnic Institute, with G. E. Doan, Lehigh University, as co-chairman. A paper by Professor Robert S. Green, of Ohio State University, attempted to define the field of Welding Engineering and the professional title of Welding En-

gineer. These definitions plus specified objectives should form the basis for training, said Professor Green. The four-year program of training offered by the LeTourneau Technical Institute was described by Allen C. Tyler of that organization.

Ship Structure Research

Another convention feature was an all-day symposium on ship structure research at which papers were presented by Rear Admiral Ellis Reed-Hill, U.S.C.G., chairman of the ship structure committee; Prof. S. T. Carpenter and Captain W. P. Roop (U.S.N. ret.), Swarthmore College; Dr. C. F. Tipper, University of Cambridge, England; E. M. MacCutcheon, C. L. Pittiglio, of David Taylor Model Basin, U.S.N., and R. H. Raring, National Research Council; Noah Kahn and Emil Imbembo, New York Naval Shipyard; L. J. Klingler and L. J. Ebert, Case Institute of Technology; C. B. Voldrich and P. J. Rieppel, Battelle Memorial Institute; Prof. J. M. Lessells and H. E. Jacques, Massachusetts Institute of Technology; and W. H. Bruckner and N. M. Newmark, University of Illinois.

Machinery Welding

One of the best sessions the writer had the privilege to attend was that on machinery welding. Charles H. Jennings, of Westinghouse, acted as chairman and L. S. McPhee, of Whiting Corp., as co-chairman. Exceptionally good papers were given by Anthony K. Pandjiris, Pandjiris Weldment Co., St. Louis; E. R. McClung, Lukenweld, Inc., Omer Blodgett, The Lincoln Electric Co., and J. A. Cunningham, J. A. Cunningham Equipment, Inc., Philadelphia.

In speaking on weldment design vs. engineering practice, Mr. Pandjiris presented 11 steps to be carefully followed as a safeguard against hurried judgment. These steps, in the proper order, are: (1) loads imposed—magnitude and directions; (2) service or the amount of "load usage" the structure is to withstand; (3) application dimensions and surfaces; (4) stress calculations; (5) picturing—to stand off and consider where the theory has taken us; (6) consideration of price and appearance; (7) shop tools—what's available and what isn't; (8) stress relieving; (9) shop consultation to iron out trouble points; (10) mechanical drawing; (11) follow-through in the shop.

Mr. Blodgett gave some interesting figures on deposition costs in his paper, "Lowering Cost of Welded Construction." The cost of depositing 1 lb of weld metal is about $1.50 per lb using 1/8-in. electrodes, $3.60 with 5/32-in. electrodes, $3 with 3/16-in. electrodes; $1.60 with 1/4-in. electrodes; $1.20 with 5/16-in. electrodes and only 50c per lb using the automatic submerged-arc process. Hence a 50-lb box of 1/8-in. electrodes costs $150 deposited, a 50-lb box of 3/16-in. electrodes $100; a box of 1/4-in. electrodes $55 and a coil of automatic welding wire less than $25 for the same 50 lb.

Mr. Cunningham's subject was "How to Cut Maintenance Costs with Aluminum-Bronze Electrodes." Hard grades of aluminum bronze provide low-friction, non-seizing surfaces that wear well against mating steel parts, he said. Aluminum bronze melts at 1,950 F—700 F under the melting point of steel. Worn gear teeth, large and small, can be rebuilt without subsequent machining, though machining will be required for such applications as shafting, pulley sheaves, slides and guides, etc. Five grades of hardness are available: ECuAl-A, hardness 120 Brinell; ECuAl-B (160 Brinell); ECuAl-C (200 Brinell); ECuAl-D (250 Brinell); and ECuAl-E (300 Brinell).

Zinc Die Castings

A very good paper indeed was given by Roland H. Ogden, Aladdin Rod and Flux Mfg. Co., on the welding of zinc-base die castings. "To mention a few of the many uses to which die castings have been applied," said Mr. Ogden, "we see such diverse items as typewriter frames, aircraft instrument parts, railroad signal devices, toys, machine tool frames, gears, automobile parts and food mixers. Nor must we forget to mention that most important functional article—the zipper."

The idea is still prevalent among weldors that white metal or, more properly, zinc-base alloy cannot be welded. This is scarcely surprising in view of the dearth of information on the subject. A search of the literature published in the German, French, Russian and English languages brings to light less than 15 papers on the subject to date. White metal can be welded, however, and if the welding is properly done the parts will be left as strong structurally as they were before.

Resistance-Welding Papers

A rough check of the convention program reveals at least 17 papers on resistance welding—a number sufficient to fill three full sessions and spill over into two other sessions. To single out only a few papers for special mention:

Spot-Weld Consistency Studies by Julius Heuschkel and H. C. Bitzer, Westinghouse Research Laboratories. This is the paper that won first prize in the RWMA contest. It described a new procedure said to be superior to conventional quality-control procedures since it will detect off-schedule welding before the results are reflected on the quality control chart and before poor welds are made.

Slope Control and Its Effect on Spot and Projection Welding by Ivar W. Johnson, works laboratory welding section, General Electric Co. A very important contribution made by the slope control is that it now makes possible the projection welding of aluminum, a feat hitherto impossible. The slope control is a supplementary device, used in conjunction with standard phase-shift welder control panels, which permits a gradual increase of the current from a minimum of 20% to full welding current over a period of time variable from three to 13 cycles. In effect, the slope control is a variable resistor in series with the heat-control potentiometer. This paper won second prize in the RWMA contest, as it well deserved to.

Homopolar Generator Stored-Energy System for Resistance Welding by Thomas J. Crawford, Progressive Welder Co. This paper was in the nature of a progress report on the development of a stored kinetic-energy system of power supply for resistance welding. Designs have been made for engine-powered field installations rated up to 150,000 amp.

Circuit Analysis of Frequency Converter Welders by W. K. Boice, General Electric Co. This paper described the electrical characteristics

(Continued on page 54)

Metal Show

Economy in Production is theme of 31st National Metal Congress and Exposition

BY WILLIAM C. HENZLIK

FIVE LEVELS and nearly five acres were covered by the exhibits

THIRTY-FIRST annual National Metal Congress and Metal Exposition closed its doors on Oct. 21 after a six-day run which broke all attendance records. More than 68,000 people were tallied upon entering the Lakeside entrance of Cleveland's mammoth Public Auditorium.

The hundreds of brightly colored booth decorations, throngs of people, bright lights and whirring machines contributed a circus-like atmosphere to the exhibition areas. Nevertheless, a serious concept was being dramatically shown. How to achieve "Economy in Production" in the metalworking field was demonstrated time after time by the newest of machines and processes. Close attention was paid to every display by the 37,000 people in technical positions who registered for the Metal Show.

Attractions of some kind appealed to every type of spectator who strolled about the five levels of the arena and the four exhibition halls. Among the more noticeable and unusual audience-catchers were two talking mynah birds from India named Acey and Decee. They whistled shrilly as visitors asked them the usual asinine, "Birdy, can you talk?"

A photoelectric target-shooting game proved popular at an oil company's display. Drawings for cash, a television set and other prizes were also well attended.

Welding equipment and supplies, flame-cutting, flame-treating and induction-heating equipment occupied a major part of the 200,000 sq ft of floor space. Several individual displays covered as much as 600 sq ft. Daily demonstrations were given of resistance welding, inert-arc welding, brazing, soldering and heat treating. More than 55 exhibitors displayed welding equipment exclusively. Of the several firms in attendance showing fabricated products, welding was much in evidence on all types, gauges and sizes of material.

New Welding Products

Interesting new products on display included a d-c selenium rectifier welder, argon metal-arc equipment for automatic welding of aluminum plates up to 1 in. thick, a manual argon-shielded metal-arc gun (recently applied to the welding of stainless steel at high rates of speed), a new remote control for d-c welders, a new portable flame-cutting machine, a recently developed aluminum alloy, means for welding plastics and for brazing aluminum to steel. Speed and economy of production were stressed as major advantages of the new products shown.

Army and Navy exhibits attracted many spectators as usual. The welding question-and-answer board, set up as in previous years, tempted many to test their knowledge. A cutaway centrifugal-type turbojet engine, a 21-ft torpedo, various guns, shells and other ordnance items were prominently displayed. Samples of ship plate from a welded tanker which failed last year drew considerable interest from welding men since an all-day symposium on ship structure was one of the features at the AWS meeting.

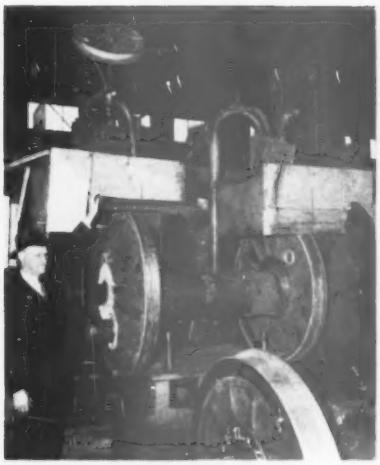
Inspection equipment was much in evidence, including X-ray, magnetic-particle, ultrasonic and photo-elastic demonstrations. With the advent of high-stress, high-performance products in almost every field of industry, more production engineers are expressing interest in inspection procedures.

Heavy press installations were perhaps the most spectacular displays next to welding equipment. Presses of more than 100 tons capacity were in operation. Several assembly lines for induction heating and brazing operations drew plaudits for their high-speed production.

"Economy Theaters" at both ends of the Lower Exhibition Hall showed the cost-saving features of arc welding, new steel-making processes, welded machinery design, resistance welding and induction heating by excellent sound movies, some in color. Every day the show was in progress, lectures and seminars on technical subjects were given in clubrooms on the second floor of the auditorium. Roundtable discussions on the theme of economy in production were also held eight times during the week.

It is no wonder that more than one visitor said: "There's just too much here to see in one day; I'm coming back tomorrow!" Hundreds of students from vocational schools, high schools and colleges in the Cleveland area visited the show on Tuesday and Wednesday. Surprisingly enough, many women were seen at the show, some with their husbands but others apparently there just for the purpose of examining the metalworking processes.

As souvenirs of this Metal Show, the biggest and best yet, visitors had many items to choose from. Among the most popular were small inert-arc-welded aluminum beer barrel coin banks, bathing beauty nail files made by a precision stamping process, ashtrays from green molding sand and a cigarette lighter machined from steel tubing.



1—BUILDING UP wheel centers with an automatic welding process

2—AUTOMATIC WELDING also fabricates the center sills of caboose underframes. Two Z-beams are mounted and clamped in the long welding jig

Railroad Shop Welding

BY FRED M. BURT

SPREAD OVER about 143 acres near downtown Los Angeles, the Southern Pacific general shops are maintenance headquarters for 168 steam locomotives on this railroad's Los Angeles division. Work is also done on 64 Diesel switchers, passenger and freight locomotives. The operation is big business in every way, about 1,800 workers being employed in the railroad's motive power and car departments. Output capacity is ten rebuilt steam locomotives per month; light and heavy repairs on eight passenger cars and 30 freight cars daily and the production-line construction of six new all-steel cabooses per week. All of these jobs involve welding.

All Welding Processes

The welding processes involved include arc welding; oxyacetylene welding, brazing and cutting; inert-arc welding; automatic welding build-ups; flame-hardening; metallizing; magnetic-particle inspection.

In making a complete overhaul of a steam locomotive, the first step is to list the work to be done on a large "shop routing schedule" board. Each engine brought in is entered in order of date on a horizontal line, and its progress record is kept by date entries made under consecutive headings over vertical columns.

Scheduled Operations

Operations listed are:
Stripped; delivery of materials; frames; cylinders, shoes and wedges; crossheads and pistons; boiler; boiler fittings and studs; hydro test*; units and steam pipes; steam test; car and running boards; air pump and feedwater heater; lagging and jacket; cab fixtures; pipe work; electric work; fire pan; brick work; guides; wheels and boxes*; trucks; back shaft and boxes; reverse shaft and boxes; spring rigging; booster; motion work; engine wheeled; valves set; side and main rods; brake rigging; tender; painting; out of shop.

Items starred represent key points in the work progression.

Metal-arc welding is used in more of these operations than is any other type of welding; there are about 20 portable arc welders alone in the huge 205 by 480 ft main building. This houses the stripping and erecting shop, equipped with a 200-ton crane, two 15-ton cranes and 24 engine pits in a bay 84½-ft wide. In addition to weld repairs, a considerable amount of welded fabrication is done to produce such engine parts as transmission bars and other units that replace hard-to-get castings. A large amount of arc welding is also involved in building benches, jigs, fixtures, tool and materials racks and all sorts of other gadgets and accessories.

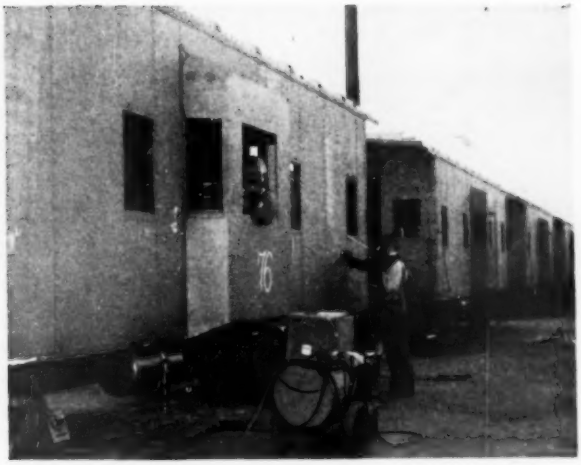
Wheel Build-Ups

Locomotive wheels take a lot of beating during their period of hard service. Finally, the wheel centers become out-of-round and worn, when they are poor supports for the tires. These wheel centers are built up, after the 3¾-in.-thick circle of tire steel has been removed, by an automatic welding process.

A machine was built out of an old journal turning lathe to hold two wheel centers at a time while they are being built up through the automatic application of 3/16-in. mild-steel electrodes. Fig. 1 shows a wheel undergoing this process while a second wheel is awaiting the mounting of a new reel of welding wire. The steel brushes in the background of the picture rub against the weldment to remove scale. The gentleman to the left is Henry L. Kidwell, general machine foreman.

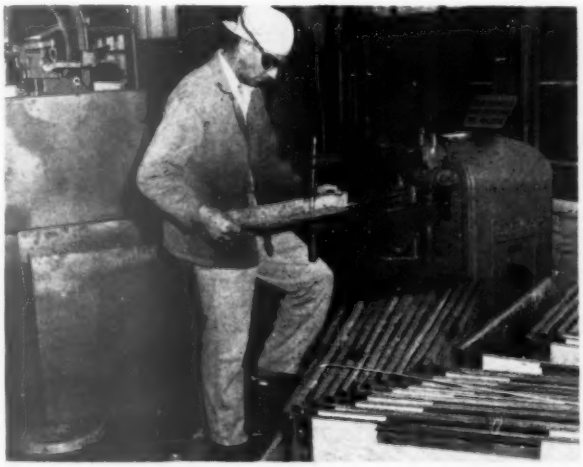
The wheels make one revolution in 16 minutes. From 20 to 22 beads are laid on a wheel of 5-in. width to get

3—FINISH WELDING of underframe of the new S. P. caboose at the first station in the production line



4—WELDING ONE of the bay windows of the caboose, which represents first major style change in 75 years

Modern railroading would quickly become a dead duck if all of the welding and other techniques described in this article were to be suddenly eliminated from maintenance, repair and construction work



5—SPOT WELDING is done in sheet-metal shop. At left are spot-welded stove shields for new cabooses

6—INERT-ARC welding stainless steel with direct current. A-c welder at right is used for aluminum

a 1/8-in. build-up. Sometimes a second thickness is applied but no more. A pair of wheels can be built up in from five to seven hours with but one operator. When it was done by hand welding, it took two weldors eight hours to build up the two wheels by laying the beads transversely. And it wasn't nearly as good a job because blowholes often resulted.

After the built-up wheels have been allowed to cool, they are machined to standard diameter in a tire turning lathe. The tires are also bored to the standard diameter calculated. This is about 0.001 in. less per inch of circumference than the diameter of the wheel center. The shrinkage allowance (according to the tables) ranges from 0.030 in. for a 29-in. tire to 0.095 in. for a tire for a 74-in. diameter wheel center. The tire is heated at 370-400 F with heat applied to the outside from a gas-fired circular burner manifold. The temperature is checked with temperature-indicating pellets. The heated and expanded tire is slipped over the wheel center and allowed to cool to room temperature, when it is as firmly placed as though it were an integral part of the wheel.

Center Sills

The same automatic welding equipment is used in the car shops for welding together two Z-beams to form the center sill of the underframe for the Southern Pacific's new all-steel caboose. The center sill is 37 ft 9¾ in. long and is fabricated of ⅜-in. mild-steel plate. A traveling carriage moves the welding head along the beam to do the job in 23 minutes.

7—GAS WELDING with steel filler rod joins lubricator stud to link. At back are sheaves to be rebuilt

8—FLAME-HARDENING a link. A hydraulic cylinder raises or lowers the platform which supports the link

Applications of oxygen and acetylene are highly diversified at S.P. shops

Fig. 2 shows two Z-beams of the center sill mounted with clamps in the welding jig. Note the camber in the center. The 3½-in. camber will drop down to ¼ in. after welding has been completed. Even the ¼-in. camber flattens out after the caboose load is applied during the final construction.

A ¼-in. mild-steel electrode wire of the E-6013 classification is used on this job. A special control in the welding head maintains a wire feed that provides a constant arc. The arc would be the same even on a corrugated surface or if there were a hole in the wheel perimeter.

Another jig set up in line with the center sill fixture was built to hold driving boxes and guides so that the same welding head can be moved to it for similar work. Several driving boxes are clamped in line and connected with ⅜-in. plate so that a continuous weld can be made. The joining plates are later separated by flame-cutting.

The following operations must be undertaken in the construction of the caboose underframe: (1) welding of center sill; (2) riveting; (3) fitting the balance of the underframe to the center sill; (4) transfer to welding jig—wheels are mounted on each end of the center sill and these are placed in stanchions in the long welding booth so that the whole 96½-in.-wide underframe can be revolved 360 deg to provide for downhand welding; (5) to sandblast; (6) final arc welding.

Fig. 3 shows the finish arc welding of the underframe of an all-steel caboose after it has been placed on trucks to move down the assembly line. This is the first work station in the line production of the caboose. In Fig. 4, weldors are doing finish work on one of the bay windows of the caboose, streamlined style of which represents the first major caboose change in 75 years.

Magnetic Inspection

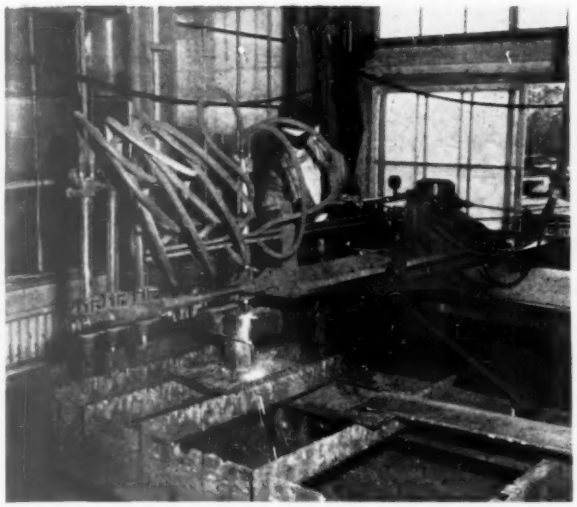
The shops are well equipped with magnetic inspection units to detect flaws in ferrous metal parts. Such inspection is used to detect in certain cast-iron parts defects to be subsequently repaired by welding. Extreme care is taken to examine moving parts of locomotives or cars. A large magnetic-particle inspection unit is used on such items as forged driving rods, and a portable unit is taken to different parts of the shop to check frames and other parts. A smaller portable unit is used on the wheels of passenger cars, and a fluorescent-powder outfit is employed to check axles. The powder is applied to the surface of the axle in an oil stream, and the magnetic field is set up from end to end. The area to be inspected is hooded and examined under ultra-violet rays. As the shaft revolves, the operator watches it carefully to see if he can find any congregation of particles that might indicate a crack.

Spot Welding, Inert-Arc

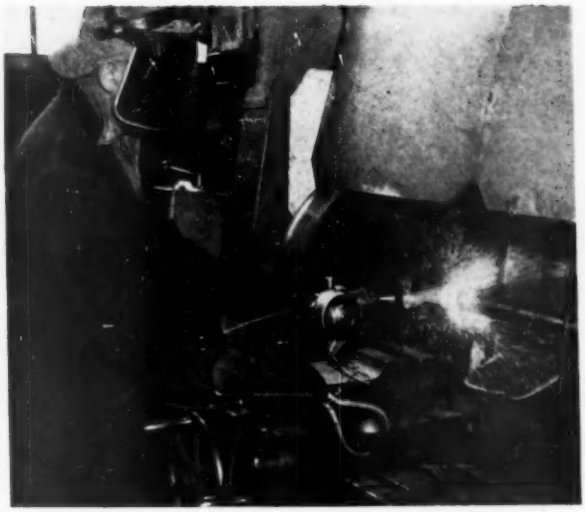
The 87 by 105 ft sheet-metal shop is equipped for practically every type of work that can come to such a department, including a rocker arm welder (Fig. 5). At the left of Fig. 5 are stove shields for the new cabooses which were assembled by spot welding. Of greater interest, however, is the use of inert-arc welding. Fig. 6 shows operator Wayne Apple welding a stainless-steel water tank with a 150-amp d-c welder. D-c machines are used for welding mild and stainless steel parts such as tanks, air conditioning equipment units and many other items including a water sump made of a 96% copper alloy. An a-c welder with high-frequency arc control (right of Fig. 6) is used for aluminum welding.

Twin pipe lines carry acetylene and oxygen to all parts of the main building, to the roundhouse, boiler shop, car shop and other points where needed. There are dozens of outlets. Each department has its own oxyacetylene welding and cutting equipment, assigned to the men doing this type of work. Acetylene comes from a centrally located generating plant, and oxygen is fed from a large manifold of oxygen cylinders.

Applications of oxygen and acety-



9—FLAME-CUTTING with multiple-torch machine. At right is the 43-in. wide, 18-ft long template table



10—METALLIZING cam shaft of refrigerator compressor. Medium-carbon steel is sprayed to build up shaft

lene are highly diversified, including welding, flame - cutting, brazing, flame-hardening and metallizing. Fig. 7 shows one of the two steel benches in the main building where oxyacetylene welding and brazing are done and also build-ups of broken or missing sections of various parts. The operator in the picture is using a steel filler rod to weld a lubricator stud to a link. At the right are throttles built up with nickel-steel rod and in the background are sheaves with broken sections of rims to be rebuilt with bronze rods. Steel, bronze, cast-iron and different types of low-temperature welding rods are all used in this shop.

Flame-Hardening Jobs

Both flame-hardening and metallizing set-ups are located in the tender shop. Locomotive driving box equalizers are flame-hardened by hand; all other parts are hardened automatically. This work is in charge of operator S. E. Lobek, who is shown in Fig. 8 flame-hardening a link with the automatic equipment. The link rests on a steel platform under the water level, which platform can be raised or lowered by hand throttle control to maintain proper levels on the parts being hardened. The platform is supported on a small hydraulic cylinder, which slowly raises or lowers it as controlled by the throttle. Such items as radial buffers, links and other parts that have a radius to be followed are raised or lowered so as to keep the point-of-flame application at a constant level and to keep the cooling water flowing away from the flame.

The water tank is 100 in. long by 28 in. wide by 28 in. deep and is able to handle such large parts as piston guides, engine truck bolsters and driving box equalizers. Tips used range from ¾ to 4 in. wide. Each tip carries two rows of oxyacetylene burner holes, while a third row of smaller holes for the ejection of cooling water is provided at an angle of 5 deg off the flame.

Some interesting hardness readings are provided by Mr. Lobek. The first of the two figures following the part name represents hardness before flame-hardening and the second the hardness after hardening. The hardnesses are all Rockwell C, but the readings were taken with a Shore scleroscope and converted to the Rockwell scale:

Tire steel 25, 46; axle steel 20, 41; axle steel 20, 46; billet steel 20, 41; mild-steel welding rod (used for a surface build-up, then flame-hardened to become a hard-facing) 22, 29; ¼-in. high-carbon welding rod (used to build up a machinable surface and then flame-hardened) 25, 35; ⅜-in. structural reinforcement steel rod 15, 33; cast steel driving box 15, 41.

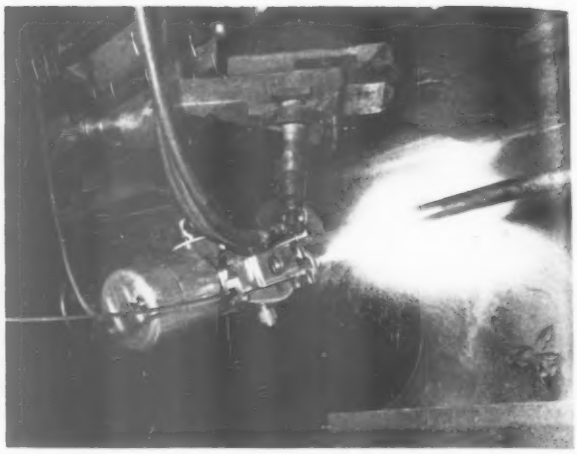
Flame-Cutting, Metallizing

Shape-cutting is done with multi-torch equipment (Fig. 9). The main unit has a pattern table 43 in. wide and 18 ft long where templates can be placed to guide the movements of the four cutting torches. The torch-carrying arm has an extensible length of 84 in. Blanks for such parts as main drive rods, side rods, draw bars, pedestal binders, passenger car truck equalizers and all kinds of steel-plate parts are flame-cut to rough form prior to machining. Some parts are even used as cut. A portable flame-cutting machine is used to make both straight and round cuts.

Near the flame-hardening department is the bailiwick of Walter Dalton, who does a variety of metallizing jobs with Monel, stainless steel, bronze and medium-carbon and high-carbon steels. Fig. 10 shows the application of medium-carbon steel to a refrigerator compressor cam shaft; preparation was done on the same lathe used for spraying. Other units built up by metallizing include armature shafts for bearing fits (medium-carbon steel), generator hanger shafts (medium-carbon steel) water pump shafts (Monel), compressor hubs (stainless steel) and switch selector box cam shafts (stainless steel).

The writer is indebted for the able assistance and fine coöperation of W. J. McHugh, superintendent of shops; Henry L. Kidwell, general machine foreman; H. E. Miller, general foreman of the car department; R. J. Quinby, general foreman, department of motive power; Fred Woodward, manager of the news bureau; and for the fine pictures to Al Rommel, Southern Pacific photographer.

FOUR STANDARD metallizing guns are used to apply 480 lb of ⅛-in. nickel wire on roll. One heavy-duty gun with 3/16-in. wire would do the job in less time



HEAVY-DUTY electric-feed metallizing gun is spraying stainless steel on a pump shaft. With this model, costs of spraying have been reduced by as much as 75%

Metal Spraying Costs

Four handy tables help you to calculate operating costs per hour, speeds in lb per hour, thickness per lb of sprayed metal and lb of metal required to spray a cylindrical surface of given diameter

BY L. E. KUNKLER
President, Metallizing Co. of America

THE MOST common method of figuring the cost of metal spraying is on a pound per square foot basis. The cost of spraying one pound of metal over one square foot of surface will depend on the spraying speed of the various metals, the cost of the particular metal being sprayed and the cost of operating the metallizing gun. The pound per square foot basis is used whether the areas involved are large or small.

It is quite impossible to compile a list of spraying costs which will fit all sections of the country. Labor, materials and other items vary greatly as to locality, and costs of the various items also fluctuate. It is impracticable even to attempt a stable listing of costs. As a result, our first step will be to itemize the gun operating costs on an hourly basis and break down the total to a spraying cost per pound of metal sprayed.

Though almost any fuel gas can be used with metal-spraying equipment, those that give the most satisfactory results are acetylene and propane. Propane is an excellent gas and gives good performance, but inasmuch as acetylene is so widely known and extensively used the spraying costs that follow will be based on the use of acetylene. Using either gas, the operating costs will be approximately the same.

Hourly Operating Costs

The items which enter into the cost of operating a metallizing gun are labor, fuel gas, oxygen, air and maintenance of the gun. Depending on locality and today's market, competent operators are available at $1-$2 per hour, acetylene gas at $2.50 a hundred ft, oxygen at $1 per hundred ft and air at 1 to 1½c a hundred ft. All but labor are average prices, which may scale down somewhat under favorable contracts.

Averaging the cost of labor at $1.50 per hour and using the figures given for gas, oxygen, etc., the operating costs for a standard gun and a heavy-duty electric-feed model are given in Table I. The gas consumptions shown are based on an acetylene pressure of 15 psi and an oxygen pressure of 16 psi. These are normal operating pressures for both types of guns.

All other things being equal, the spraying speed of a metal spray gun depends principally on the size of the wire used. In the lightweight manually operated gun, ⅛-in. wire will give the greatest spraying speed whereas with the heavy-duty, high-capacity electric-feed gun 3/16-in. wire will give the maximum spraying speeds. Smaller wires can be used in either type of gun but with a sacrifice in speed.

Table II gives a list of metals commonly used in the metallizing industry; the conservative spraying speeds shown can be maintained by any experienced operator. The figures given are the number of pounds that can be sprayed per hour and are based on ⅛-in. wire for the standard gun and 3/16-in. wire for the heavy-duty model.

These speeds can be stepped up considerably by using higher gas and oxygen pressures. The increase in speed will be roughly proportional to the increase in gas consumption.

Costs for Flat Surfaces

As an illustration of how the metal-spraying costs are estimated, let us assume that a Tobin bronze coating

Table I. Average Hourly Operating Costs

Standard Gun		Heavy-Duty Model	
Labor	$1.50	Labor	$1.50
Acetylene ..... 23 ft	0.57	Acetylene ..... 44 ft	1.10
Oxygen ..... 50 ft	0.50	Oxygen ..... 68 ft	0.68
Air	0.15	Air	0.15
Maintenance	0.10	Maintenance	0.10
Total	$2.82	Total	$3.53

Table II. Lb Sprayed per Hour

	Standard Gun	Heavy-Duty Model
Aluminum	5½	12
Copper	12	24
Bronzes	14	30
Iron	8	16
Lead	100	150
Steels	8	16
Tin	60	100
Zinc	24	60

Table III. Coating Thickness*

	Thickness, In.
Aluminum	0.062
Copper	0.018
Bronzes	0.018
Iron	0.020
Lead	0.010
Steel	0.020
Tin	0.017
Zinc	0.017

**For 1 sq ft per lb of sprayed metal*

Table IV. Lb of Metal Required per Lineal Inch of Shaft

Circumference, In.	Shaft Diam., In.	Coating Thickness, In. 0.0313 1/32	0.0625 1/16	0.0938 3/32	0.1250 1/8	0.1563 5/32	0.1875 3/16
3.1416	1.000	0.065	0.130	0.195	0.260	0.325	0.390
3.9270	1¼	0.072	0.144	0.216	0.288	0.360	0.432
4.7124	1½	0.080	0.159	0.239	0.318	0.398	0.478
5.4978	1¾	0.087	0.173	0.260	0.346	0.433	0.520
6.2832	2.000	0.095	0.190	0.285	0.380	0.475	0.570
7.0686	2¼	0.103	0.205	0.308	0.410	0.513	0.616
7.8540	2½	0.110	0.220	0.330	0.440	0.550	0.660
8.6394	2¾	0.116	0.232	0.348	0.464	0.580	0.696
9.4248	3.000	0.126	0.251	0.377	0.502	0.628	0.754
10.210	3¼	0.134	0.267	0.401	0.534	0.668	0.802
10.996	3½	0.143	0.285	0.428	0.570	0.713	0.856
11.781	3¾	0.150	0.300	0.450	0.600	0.750	0.900
12.566	4.000	0.159	0.317	0.476	0.634	0.793	0.952
13.352	4¼	0.166	0.332	0.497	0.664	0.830	0.996
14.137	4½	0.174	0.347	0.521	0.694	0.868	1.042
14.923	4¾	0.181	0.362	0.543	0.724	0.905	1.086
15.708	5.000	0.189	0.377	0.566	0.754	0.943	1.132

of 0.006-in. thickness is to be applied over a large area. For certain reasons, it will be preferable to use a standard gun so the costs will be based on the use of the lightweight model. The job will require about 100 lb of bronze, costing 64c per lb, delivered.

From Table I, the operating cost of the gun is $2.82 per hour and its spraying speed with bronze (Table II) is 14 lb per hour. Therefore the cost of spraying one pound will be $2.82 ÷ 14 or about 20c per pound. Adding to this the cost of one pound of bronze (64c) gives a total cost of $0.84 for spraying one pound of Tobin bronze.

Reference is now made to Table III, which gives the average thickness of a sprayed coating one square foot in area per pound of metal consumed. From this table, it may be seen that one pound of bronze covering one square foot of area will have a thickness of 0.018 in. It is readily recognized that a coating 0.006 in. is a third of the 0.018-in. thickness and therefore a third of $0.84. The cost of spraying the Tobin bronze coating, therefore, is $0.28 per square foot.

Cylindrical Surfaces

The method of estimating the cost of cylindrical coatings is quite similar to that used in estimating the cost of spraying flat surfaces. It should be pointed out, however, that there are extra losses that occur when spraying small circular elements like shafts, pistons, etc. These losses may run as high as 60% in some instances so it is necessary to make allowance for them and spray on more metal than appears necessary.

To facilitate matters and reduce to a minimum the calculations necessary, consult the metal requirements compiled in Table IV. This tabulation takes into consideration the added losses referred to and will be found useful in determining the amount of metal required for any shaft coating within its scope.

The first column on the left gives the circumferences that correspond to the diameters shown in the second column. These circumferences are useful in estimating the area of the surface to be prepared by threading, grit blasting or bonding. The columns on the right are headed by figures representing the thickness of the coating desired, given in fractions of an inch and their decimal equivalents. In any selected column opposite the specified shaft diameter will be found the pounds of metal required per lineal inch of length.

To illustrate the use of Table IV, we will consider a shaft 3 in. in diameter that is to be coated with 0.10% carbon steel. The coating is to be ⅛ in. thick and 10 in. long.

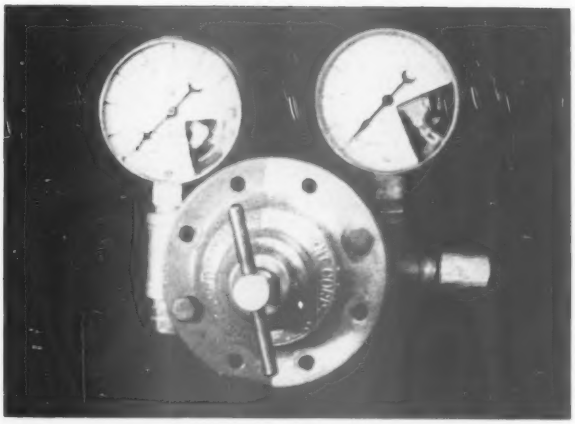
The circumference of a 3-in. shaft is approximately 9½ in. Multiply this by 10 in. (net length of coating), and we get 95 sq in. that will require preparation. However, there are always some end losses on a shaft coating so about 2 in. should be added to the length, which will make the total length 12 in.

Run down the column headed by ⅛ (thickness of coating) until the shaft diameter of 3 in. is found. The figure at the intersection is 0.502. This multiplied by 12 in. (the length of coating) will give 6.02, the number of pounds of steel required.

Referring back to Tables I and II, we find that the operating cost of the heavy-duty gun is $3.53 per hour and that it will spray 3/16-in. steel wire at the rate of 16 lb per hour. The cost of spraying 1 lb will be $3.53 ÷ 16 or $0.22. At the present writing, 3/16-in. 0.10% carbon-steel wire in 100-lb lots costs 22c per lb. This added to the spraying cost gives $0.44 as the total cost of spraying one pound of steel.

We have already found it required 6 lb of steel to spray the 3-in. shaft. At a spraying cost of 44c per lb, the total cost of spraying the shaft will be $2.64, the answer to our problem.

The cost figures given do not include surface preparation, which will vary considerably, depending upon the method of preparation used.



1—CUTAWAY SAMPLE regulator is carried in kit of each salesman to show clean surfaces inside and out

2—FOUR SEPARATE oxyacetylene systems are under large work bench. Note refinishing lathe in background

BILL JOHNSON, Chicago welding distributor, holds that complete repair service for gas equipment is indispensable to his business

3—ALUMINUM PANS on numbered shelves hold the torches and regulators while they undergo repair

Large Scale R

Distributors whose repair service is confined to a small corner of the shop may like to read of an establishment where five full-time men are employed just to repair and rebuild torches and regulators

BY WILLIAM C. HENZLIK

ONE OF the largest and most successful establishments in the midwest for the repair of oxyacetylene welding and cutting equipment has been developed at Johnson Welding Equipment Co., Inc., 2640 West Van Buren St., Chicago. A five-year accomplishment, the repair shop now employs five full-time men. Personnel and shop equipment are part of a well-run team that handles all makes of welding and cutting torches, oxygen, propane, acetylene regulators, "gas-saver" attachments, manifolds, special fittings, cylinder fittings and custom-made equipment.

W. F. ("Bill") Johnson, the proprietor of Johnson Welding Equipment Co., is an old-time distributor of gas-welding equipment and welding rods. He conceived the role of the repair shop as a necessary and very practical adjunct to his business.

Repair Shop Makes Money

Distributors who maintain only a corner of their premises for repair purposes as a service to the customer usually do only a small volume of "walk-in" business. The situation is vastly different at Johnson, where the shop is large and volume has been increasing steadily for the past several years under the leadership of Mr. Johnson and his able foreman, Oscar Franzen.

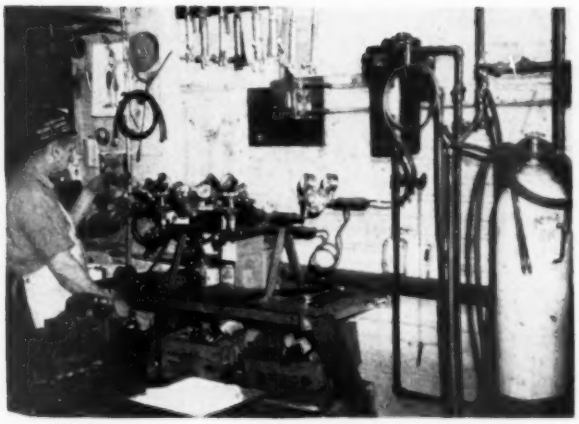
Most of Johnson's repair men have been steady employees since they were hired. Turnover has been almost nil. Such longtime experience pays dividends when odd and unusual jobs come into the shop.

Foreman Franzen and his assistant, Julius Orzech, have both received special training at the plant which manufactures the gas-welding equipment that Johnson distributes. This specialized knowledge is handed on to the other repair men. New repair manuals, instruction bulletins and technical information are constantly studied by the men to keep their knowledge of new developments up-to-date.

"Rebuilt," Not Repaired

When Mr. Franzen first came to work for Johnson in 1944, he brought along an idea which is perhaps primarily responsible for the success of the rebuilding shop. This was, briefly, that every attempt

4—REPAIRED TORCH is tested, and flame is adjusted for neutral, oxidizing and carburizing conditions



5—NITROGEN under high pressure is used to test regulators. Four regulators can be tested at same time

Repair of Gas Equipment

should be made to "rebuild" the customer's torch or regulator rather than simply "repair" it. Replacement of a damaged valve or tube with a factory part would in the long run assure better service, cost less and bring back business to the shop. Satisfied customers are repeaters.

To aid in explaining the quality of repair work done at Johnson's, each welding equipment salesman carries a sample regulator and gauge similar to that shown in Fig. 1. The body of the regulator shows the contrasting shades of finish before and after cleaning. An arc is cut out of the dial face of the regulator to show that the inside is cleaned as well as the outside. Since many repair shops have in the past buffed off the grime on the outside of the regulators while leaving the inside corroded, dirty or even oil-soaked, this cutaway regulator is regarded as a very useful sales aid.

Salesmen in the distributor end of the business are encouraged to talk good maintenance whenever they sell equipment. Specific figures are cited, if possible, on how maintenance pays off in safety, efficiency, speed and quality work. Group maintenance, as for a construction company, a steel mill or a fabrication plant, is also talked up as a sensible measure. Since much of the modern gas-welding equipment made is rugged enough to last many years with proper treatment, the purchaser can protect his original investment with periodic skilled servicings.

Equipment to be repaired is always brought directly to the repair shop and is not handled by any other departments of the Johnson organization. Such duties as registering the part in the office or entering it on other records are not necessary. The customer is taken directly to the repair department and given a chance to explain right away what he thinks the trouble is.

Location of the repair part of the Johnson establishment is at the back of a 60 by 100 ft building on Van Buren St. It is separated from the welding equipment storage area by a large concrete-block wall on two sides. As the customer enters the repair shop door, he sees a well-equipped, busy shop (Fig. 2). Four repair men are performing various operations on welding equipment, which is in various states of assembly all over the work benches, the wall shelves and the testing apparatus.

Mr. Franzen usually talks to the customer about the part brought in to be repaired. He or Mr. Orzech then writes down the probable cause on one of two special record cards. Consecutively numbered yellow cards are used for regulators and gauges; green cards for welding and cutting torches. A perforated line divides each card into a large and a small part. The small part of the card remains attached to the equipment until the customer gets it back. On the larger portion of the card, spaces are provided to list parts repaired, parts replaced, repainting, etc., and the charges for each item. This portion of the card is detached for the company's permanent records after all repairs have been finished.

Test for Breaks

If time allows, the badly acting equipment is tested immediately after the customer has described the trouble. Sometimes the customer is able to watch the test. High-pressure nitrogen is used to test regulators, while torches are attached to one of four oxyacetylene manifold systems.

The practiced eyes of the repair man usually spots the trouble at once, and this information is entered on the record card to confirm or contradict the original diagnosis. The regulator or torch is then completely disassembled, and all its parts are placed in an aluminum pan about 8 by 10 by 1½ in. The loaded aluminum pans are kept on a series of shelves at one end of the repair shop (Fig. 3). A small brass hook holding four or more round metal discs, each stamped with the number of the shelf position, is fastened to the edge of the shelf below each pan.

Suppose that a small valve part is to be removed from the pan for processing. One of the numbered tags

6—PACKAGING is important to safe arrival of equipment. Insurance is carried against damage in transit

7—TRUCK DRIVER is about to deliver an assortment of repaired torches to a steel plant in South Chicago

is wired to that particular part by the repair man. Again, if the cover of the same regulator needs buffing, another tag is used to identify it after removal. Thus the separate parts of a regulator or torch can be all over the shop, but their return to the proper pan holding the rest of the equipment is assured.

Test Equipment

The testing of regulators takes quite a bit of time and requires a source of safe, cheap gas. Two 220-cu-ft cylinders of water-produced compressed nitrogen are connected to the two test regulator test manifolds shown in Fig. 5. When pressure on a cylinder is low, after most of the nitrogen has been used, it is connected to the paint spray guns for complete utilization of the residual nitrogen.

Connections for attaching the manifolds, gauges, etc., are brazed to copper tubing that runs from the nitrogen cylinders to the work bench or test platform.

Four complete and separate oxy-acetylene systems are laid under the working surface of the large bench shown in Fig. 2. The piping is concealed for safety reasons and also to keep it out of the way. Each workman has his own outlet for torch testing (Fig. 4). Mr. Franzen has spent many hours working out this system of piping, and he believes it to be one of the best installations of its type. For additional safety, the oxygen and acetylene cylinders are stored outside the shop proper on the other side of the heavy cement-block wall. With so many open flames in the shop, every care is taken that no inflammable material is left on the floor on the benches or in the shelves.

Every part in any make of regulator or torch can either be replaced by a factory-built part kept in stock or repaired in the shop. Replacement parts are kept in hardware-type cabinets fitted with small drawers labeled with the name of the manufacturer, model number and part number. Bending and straightening operations are performed with clamping and holding tools, either hand or hydraulically operated. Should a part need machining, a lathe is spotted near the shop entrance for this purpose. Power drills, power grinders and buffing machines are also provided.

Carbon Removed

Since all equipment that comes to the shop is cleaned, inside and out, the company has invested in elaborate cleaning and bright dip facilities. Removal of carbon from the inside of torch tips and passages inside the torch is essential to proper maintenance; if it's not done the carbon deposits will hinder the proper flow of gases and may drastically impair the efficiency of the flame. In regulators, the presence of foreign particles in the metering passages and valve seats often causes trouble.

Every time a flashback occurs, some carbon is deposited inside the tip. Tip cleaners will remove carbon adjacent to the orifice but not that inside the tip body. Gradual accumulation of this deposit will cause inefficient operation. Some makes of torches have their mixing chambers closer to the tip than others and so have a relatively smaller area to become fouled with carbon deposits from flashbacks.

All traces of carbon are removed by the complete disassembly of the torch or the regulator, and the dipping of each part in a caustic cleaning bath. The display regulator exhibited by the salesman is an accurate representation of how the customer's regulator will look when it's returned to him.

Factory Parts Used

A strict policy adhered to by this shop is the replacement of badly worn or broken parts with genuine factory parts. Mr. Franzen says that each torch was designed for a particular operation and to operate properly it has to have the original parts. It isn't good policy to use "gyp" or home-made machined parts to replace those broken or worn. At first glance, they look exactly like the original, but in strength, design and operation such parts are usually much inferior.

When all of the parts in an aluminum pan have been cleaned, straightened, replaced, remachined, etc., their re-assembly is commenced by one of the operators. Every attempt is made to make each piece of equipment as nearly like new as possible. All fittings are made snug; handles, knobs, levers, etc., are checked for positive, easy operation. The bonnet and the back of the gauges are painted according to the standard color code: red for acetylene, green

for oxygen. High-quality lacquer is used, applied with a spray gun.

Testing and Packaging

The assembled equipment is given either a full-pressure test or a flame test, using full-pressure oxygen and acetylene. Regulators are tested for every pressure used in normal operations. Torch flames are adjusted to neutral, oxidizing and carburizing conditions to see that they are all equally satisfactory. When welding or cutting equipment leaves the shop, it is working as well as it did when new.

The repaired equipment is carefully packaged (Fig. 6). Out-of-town shipments are packed with excelsior or other padding to protect them in transit. Marine insurance is carried on all packages to cover losses from breakage en route to the customer.

With a smile, Mr. Franzen acknowledges that much of the shop's business would be lost if there weren't so many careless weldors. The type, for example, who try to weld 60 ft away from a cylinder truck equipped with 50 ft of hose. When the truck goes over, one or both gauges are bent or broken on either or both the oxygen and the acetylene regulator.

After finishing a welding job, many gas weldors carelessly leave the oxygen adjusting screw "in," or pressing against the regulator diaphragm, before they close the cylinder valve. When the oxygen cylinder valve is opened, high-pressure oxygen rushes by the valve seat and generates heat enough to damage the seat and nozzle before the diaphragm can equalize the pressure. Should any oil be present inside the regulator, the oxygen surge can cause a fire or an explosion. In any case, the seat damage is severe enough to let gas leak by the nozzle seat and cause the needle to start "creeping" on the gauge. This is the reason why customers diagnose a creeper as a "leaking diaphragm." Actually, not 1 in 100 diaphragms has a leak in it.

Metal diaphragms may be distorted if not ruptured by the pressure surge if an explosion occurs inside the regulator. To minimize this trouble, Johnson repair men replace metal diaphragms with Neoprene ones wherever possible.

Construction workers are perhaps the roughest people with torches. Believe it or not, the torch is often used as a hammer. Some torches have even been pounded so badly that the gas passages are exposed.

About the only thing to do in such cases is to replace all major structural parts. Such drastic rebuilding costs about as much as new equipment, but no other repair is possible. Moral: take care of your torch.

Because of their extensive experience in all types of compressed gas equipment, Johnson repair men are called upon to fix equipment in hospitals, research laboratories, dental offices and soda fountains. Medical equipment is usually nickel-plated and is quite heavily constructed. Different cleaning and machining procedures must be used.

Research laboratories often want specially modified torches or custom-built gas manifolds for their work. On such jobs, Mr. Franzen is called upon to spend a day or so away from the shop getting measurements and other information. Poor design of bends in the piping, poor placing of valves, proximity to other machinery, tiny leaks at joints, are all possible causes of trouble.

Trained men, good equipment and a sound policy toward developing and maintaining a profitable repair business pay profits to Johnson Welding Equipment Co. in a field where most others are satisfied to break even.

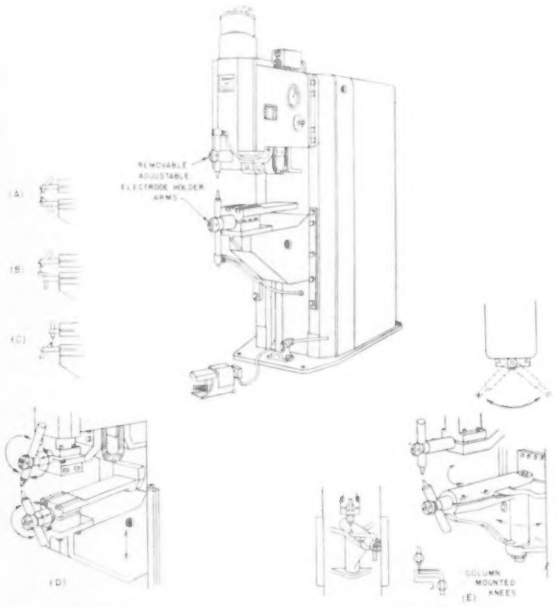
Textile Equipment Kept in Service

Maintenance men operating in textile plants have a serious problem with journal wear. They can't use as much oil as they like and so the journals of beater shafts, comb shafts, Lickerin rolls and many other types of journals, including the card feed roll journal illustrated on the right, wear out and have to be reclaimed.

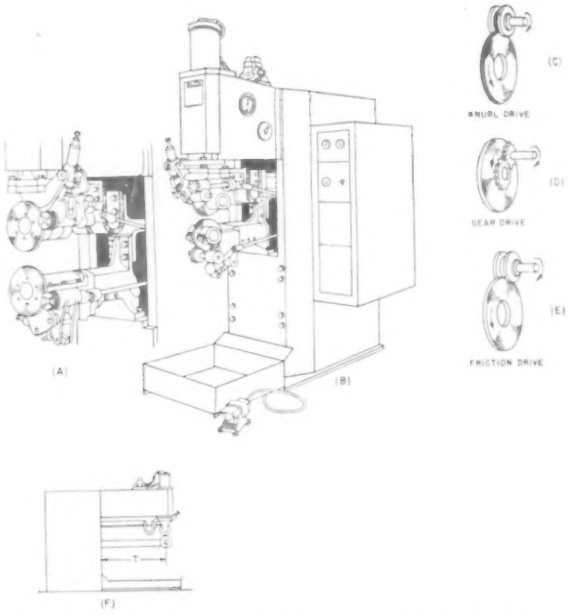
Textile men make a very profitable use of metallizing in journal repair. One large mill reports application of a sprayed metal build-up to 22 different types of journals ranging from picker rooms down to the weave room. As an example, consider the particular job illustrated. This card feed roll journal takes about 50c worth of metal plus 17 minutes of an operator's time to prepare it, spray it and finish. Once metallized and soaked in graphited oil, it will run without wear many times longer than it did originally.

Courtesy Metallizing Engineering Co., Inc.

REBUILDING JOURNAL of card feed roll for a textile plant. It stays so cool that operator can measure build-up even while the gun is running



1—PRESS-TYPE spot and projection welder. Sketches show methods of mounting electrode holders and knees



2—UNIVERSAL SEAM welder convertible to both circular welding (A) and longitudinal welding (B) and (F)

Standardized Equipment fo

If you don't know all that you should about resistance welders, read this concise summary. It covers all of the important points for the chief types of welding machines and power supply systems

BY WALLACE A. STANLEY

BEFORE a designer can take full advantage of resistance welding, in the design of his product, he must be fully familiar with the advantages and the functions of each of the standard resistance-welding machines. These standard machines include: spot welders (rocker arm, etc.,); stationary spot welders; press welders; seam welders; upset-butt and flash-butt welders; portable welding equipment and various combinations of the above.

Rocker Arm Welders

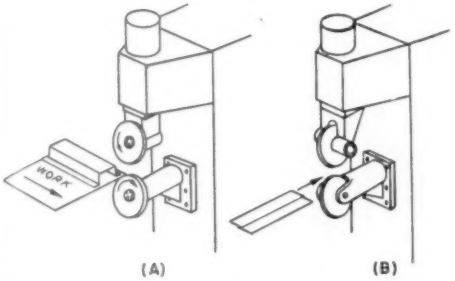
The rocker arm spot welder derives its name from the rocker action of the moving upper arm. Rocker arm welders can be made as small as 5 kva or lower or as large as those used in welding heavy aluminum aircraft parts—72 in. or more in depth. One of the features of the rocker arm welder is its versatility. The arms can usually be rotated about a 360-deg axis, and the points or "tips" can usually be easily lined up by adjusting one or the other arm in or out. In addition to this, the tip holders can be raised and lowered in relation to the arms or offset holders.

The one disadvantage of the rocker arm welder is the movement of the tip in an arc motion. This makes alignment difficult. The tips wear and create various sliding movements, depending upon their relation while welding. The welding tips can be above, below or level with the fulcrum point of the moving arm. If the tips meet in a point above the fulcrum of the moving arm, the moving tip has a tendency to slide outward from the machine. If the points meet on a line below the fulcrum of the movable arm, the moving tip has a tendency to slide inward toward the machine. Rocker arm welders are used in the welding of lighter metals (18 to 30 gauge) and on heavier gauges such as 9 gauge and thicker.

A limitation inherent in the rocker arm welder is the pressure that can be withstood by the arms without excessive deflection and the variables encountered due to the change in leverage when the arms are moved from or toward the fulcrum point. Rocker arm welders are capable of sustained speeds of as high as 325 spots per minute with short strokes but maintain a general overall output of around 40 spots per minute on the average product. They are available with foot, hand, air cylinder, hydraulic cylinder and motor-and-cam pressure applications.

Pedestal and Bench Welders

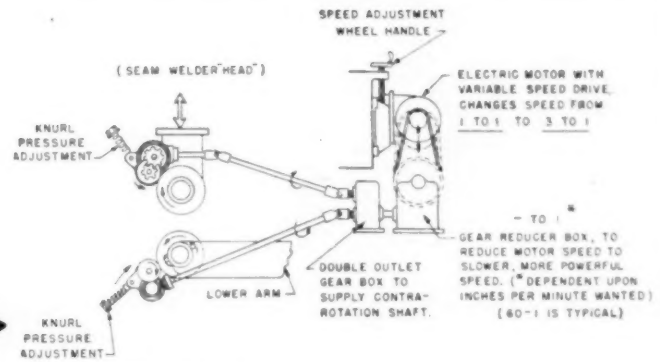
The pedestal welder, a variation of the standard rocker arm welder, derives its name from the mounting of the welder mechanism upon a pedestal. This is the form which all the

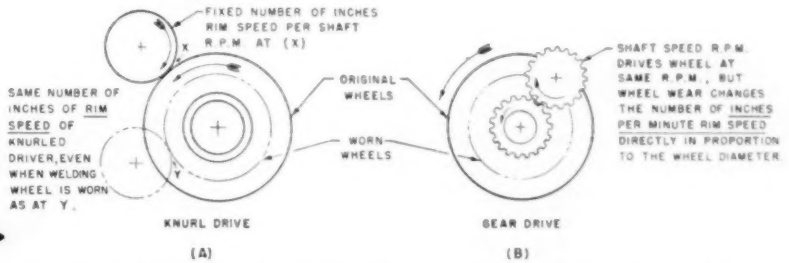


3—WORK HANDLING with wheels arranged for circular welding (A), longitudinal (B)

Types of seam welders and their drives. Mr. Stanley also discusses spot and flash welding

4 ➡


SPEED ADJUSTMENT WHEEL HANDLE
("SEAM WELDER HEAD")
ELECTRIC MOTOR WITH VARIABLE SPEED DRIVE, CHANGES SPEED FROM 1 TO 1 TO 3 TO 1
KNURL PRESSURE ADJUSTMENT
GEAR REDUCER BOX, TO REDUCE MOTOR SPEED TO SLOWER, MORE POWERFUL SPEED. (* DEPENDENT UPON INCHES PER MINUTE WANTED) (60-1 IS TYPICAL)
DOUBLE OUTLET GEAR BOX TO SUPPLY CONTRA-ROTATION SHAFT.
LOWER ARM
KNURL PRESSURE ADJUSTMENT


FIXED NUMBER OF INCHES RIM SPEED PER SHAFT x R.P.M. AT (X)
SAME NUMBER OF INCHES OF RIM SPEED OF KNURLED DRIVER, EVEN WHEN WELDING WHEEL IS WORN AS AT Y.
ORIGINAL WHEELS
WORN WHEELS
SHAFT SPEED R.P.M. DRIVES WHEEL AT SAME R.P.M., BUT WHEEL WEAR CHANGES THE NUMBER OF INCHES PER MINUTE RIM SPEED DIRECTLY IN PROPORTION TO THE WHEEL DIAMETER
KNURL DRIVE
GEAR DRIVE
(A)
(B)

5 ➡

4—DOUBLE KNURL DRIVE (top illustration). Both the wheels are driven
5—COMPARISON between knurl (A) and gear (B) drives, bottom sketches

...t for Resistance Welding*

early welders took. The same general information applying to the rocker arm welder applies to the pedestal welder, and the same pressure sources are available, although the pedestal welder is usually operated either with a foot pedal or by an electric motor-and-cam unit.

The bench welder derives its name from the fact that it is most advantageously operated when mounted on a bench. The usual model is of small size and is employed mainly for very light work such as filament wires for radio tubes, small screens for filters, spectacle frames, cash register parts, comptometer parts, typewriter parts, small fractional-horsepower motor parts, etc.

Bench welders are made in many forms, including rocker arm, direct action and press types, etc. They are available in sizes from fractional kva up to 75 kva and with speeds up to 300 spots per minute.

Direct-Action Spot Welders

The direct-action spot welder mounted in a stationary frame is available in as many styles as there are different manufacturers. The principle advantage is the avoidance of arc travel in the movable electrode. The moving tip and holder mechanism ordinarily has less mass and weight than does the rocker arm or press-type welder, and the air cylinder or other pressure source is usually mounted directly above the moving electrode.

Other advantages are high production speed, low-inertia head, fast follow-up, great versatility; rigidity impossible with the ordinary rocker arm welder. Stationary direct-action spot welders are available in sizes from 5 to 200 kva, for metal thicknesses between the gauges of 10 and 30. The most adaptable and universally used sizes are between 50 and 75 kva, for welding 16 to 22 gauge cold-rolled steel.

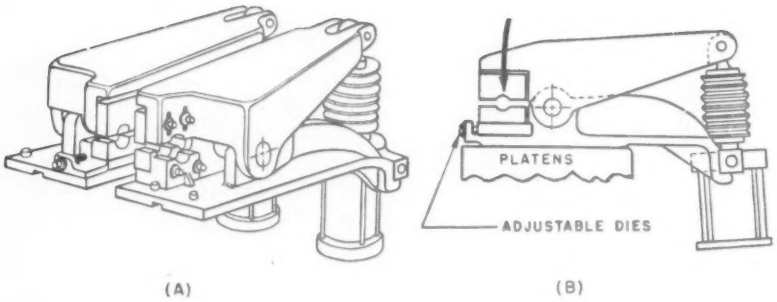
Welders of this type are available for either air, motor-and-cam, hydraulic foot-lever or hand-pressure operation, with air cylinders being the predominate pressure source.

The cost of stationary direct-action spot welders is usually much less than that of a corresponding size of press welder because of the simplicity of construction and elimination of the massive horn and ram mechanism. These welders should not be used on very heavy gauges or with excessively long moving electrode holders and tips. Tips should be confined to a minimum offset from the line of direct pressure application. The angle of the tips from the axis of the ram should also be minimized to prevent skidding and deformation of weld. In many cases, the movable electrode and cylinder unit can be offset slightly or tilted at an angle of up to 10 or 15 deg to accommodate the welding of special parts.

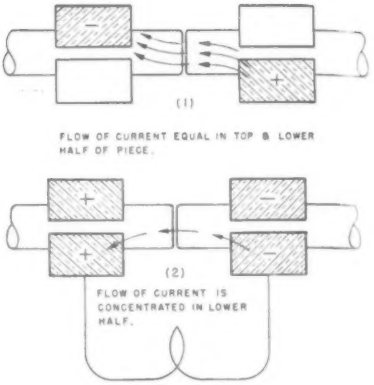
Press Welders

The press welder, the work horse of all resistance-welding machines, is so named because it is constructed like a press. The moving ram is mounted in rigidly built precision

*From Chapter 4 of a forthcoming book, *Resistance Welding—Designing, Tooling and Applications*, to be published by the McGraw-Hill Book Co., Inc., New York City.



6—VERTICAL LEVER action (air or hydraulic) clamps for light-medium flash-butt welders. Sketch (A) is three-quarters view, (B) a side view



7—CURRENT FLOW diagram. Note that connection at top avoids heat concentration in lower die halves

Flash-welding clamps are variable and versatile

guides for vertical travel. Various horn sizes are provided, usually in throat depths of multiples of six inches in accordance with specifications set up by the Resistance Welders Manufacturers' Association.

The press-type welder is a rigid, substantial machine whose useful life is usually ten years or more. Press welders come in two general groupings: projection welders which have copper platens mounted on both the lower and upper horns and the spot welder of the press type. They are often combination projection and spot welders, an arrangement shown in Fig. 1. The universality of the spot-welding arms is shown in sketches (A), (B) and (C) of Fig. 1. The arms used on the press-type spot welders are usually reversible so that vertical holders can be bolted in one end, while in the other end holders can be mounted at an angle of 30 deg. Press welders usually have a vertical adjustment on the lower knee of from several inches to two feet, but they are also available with column-mounted or special knees.

The adaptations of the press-type spot welder should be carefully studied because a predominately large amount of work is performed by this type of welder. Press-type spot and projection welders are usually built in sizes from 30 to 600 kva or more and are available with motor, air or hydraulically operated pressure sources.

Due to the enormous pressures required in sizes over 250 kva, the pressure source is usually hydraulic. The 30 to 250 kva size may be operated either by air or motor, depending upon use and available facilities. The motor-operated pressure source features economy and speed, whereas the air pressure source features versatility and speed.

Seam Welders

Typical seam welders, both circular and longitudinal, are shown in Fig. 2, sketches (A) and (B). There is also a "universal" type of seam welder—one which can be quickly changed from circumferential to longitudinal welding by rotating the upper head and substituting the corresponding lower arm and wheel mechanism.

Seam welders are driven by a motor and gear-reducing unit imparting rotary motion to the welding wheels in one of three forms: knurl drive (C); gear drive (D); friction drive (E).

The speed of the wheels is governed by a motor drive, usually connected to a variable drive mechanism offering a speed range of approximately 1-to-1 to 3-to-1. It is used in conjunction with a gear reducer unit to drive the wheels at a predetermined number of feet per minute.

For example, if requirements are from 4 fpm up, the 3-to-1 ratio would give the seam welder a speed ranging from 4-12 fpm. If requirements are 1 fpm, the 3-to-1 range would give the welder a performance of from 1-3 fpm: Speed range is usually selected before construction of the machine.

Seam welders are similar to press-type welders in their frames and upper horn movements. The lower arm, however, varies all over the map because of varying requirements of different products.

To permit the welding of "everything," the seam welder is usually selected with a fairly deep throat in the longitudinal style as in (F) of Fig. 2. The short-throat seam welder cannot be used for deep work, whereas the deep throat seam welder can be used for both short and long seams.

Continuous sprays of water are directed from water nozzles to the welding wheels and onto the work as it passes through the welder in order to minimize warpage from heat. Some manner of catching the water from the seam welder wheels must be employed; this usually takes the form of a water tank beneath the lower arm of the welder.

Standard seam welders are air operated, with cylinder movements controlled by four-way air valves. The direction of the work through the machine is shown in Fig. 3. In the circular type of seam welder, sketch (A), the work passes *across* the face of the welding machine, whereas in (B), the work passes either *into* the throat of the seem welder or *outward* from it.

The basic drive mechanisms for standard seam welders have part or all of the components shown in Fig. 4. These may not necessarily be arranged in the order shown, but basically they are the same, no matter in what location they may be placed.

The motor is usually mounted integrally with a variable-drive mechanism which changes pulley ratios over a speed range of about 3 to 1. This provides a versatility in seam-welding wheel speeds in linear feet per minute. A gear-reducing unit changes the high speed of the electric

motor, about 60 to 1, to a low output speed with very high torque. If the motor speed is 1,800 rpm, the shaft output would be about 30 rpm at the seam welding wheels.

If the seam welder has single-wheel drive (either upper or lower wheel power driven) the opposite wheel will "idle" or, in other words, be free to rotate and follow the surface speed of the driven wheel. In such a case only a single drive shaft is required, and the double outlet gear box depicted in Fig. 4 is not used. If both wheels are to be driven, a double outlet gear box (as shown) is required with the output shafts rotating in opposite directions.

Knurl and Gear Drives

Seam-welding wheels can be driven by either a gear drive or by a knurl or friction drive. The two fundamental mechanisms of the knurl or friction drive and the gear drive are shown in Fig. 5. The simpler of the two is the one in which the gear driving the welding wheel is connected directly to the shaft. The shaft speed in rpm always remains constant, but wheel speed varies with the wear on the rim. For this reason, critical inspection is necessary to make sure that the surface speed of the wheel is not greatly varied from the original setting.

Inasmuch as the shaft speed remains constant with a gear drive sketch (B), it can be readily seen that when the wheel diameter becomes smaller due to the wear on its surface (as shown in the dotted line), the circumference becomes smaller. If shaft speed remains constant, there are a less number of circumferential inches per minute delivered at the work point unless the shaft speed is stepped up to compensate for this wear. Since the controls of a seam-welding machine are set according to the surface speed of the work passing through the wheels, it can be readily understood that the gear drive mechanism requires much attention to assure surface speeds against varying too greatly from the original setting of the controls.

Advantage of the friction-type drive is that the peripheral speed of the seam welding wheels—the surface speed of the work passing through the wheels—is constant at all times regardless of the reduced diameter due to wear on the wheel. The knurled wheel or friction drive mechanism cleans and dresses the seam-welding wheel as it drives it, thereby maintaining a relatively constant face or welding surface at all times.

As the wheel wears to the dotted diameter shown in the illustration (Fig. 5), the knurl or friction wheel drive mechanism constantly bears against the surface of the welding wheel. Since the same number of inches per minute are always passing the surface of the wheels, and the surface speed remains constant regardless of the diameter, the result is that, although the shaft revolutions of the welding wheels increase, the actual surface speed of the work passing through the seam welder remains constant at all times.

This is a very important consideration in seam welding.

Flash-Butt Welders

One of the most common types of flash-butt welders has the general appearance of a table-top machine with a large copper stationary platen on one end—usually the left side—with a matching platen that is moved by any of the usual pressure sources.

A basic type of flash-butt welder has the transformer in the base and the transformer regulator or heat selector on the left end of the machine. The horizontal type of flash-butt welder is either a flat-base or a semi-special flash-butt welder having the die and clamping mechanism incorporated in the working surface of the machine. In the latter case, the copper casting for the left clamping die is a part of the working surface, while the moving platen, die and clamping mechanism form the complementing half of the welder.

Another type of welder is basically similar except that the working surface is free of any permanent dies or clamping mechanisms. This is called a "flat-face" flash welder. Construction common to both types is the extremely rigidly mounted moving platens or slide mechanisms provided to accommodate the enormous upsetting pressures necessary for a flash-butt weld.

The basic flat-faced welder may be mounted on an angle of 45 deg (also available at other angles) for the convenience of the operator in loading, unloading, clamping and welding. Clamps, dies or other parts making the complete welder set-up are added for the particular application for which the flash welder is to be used.

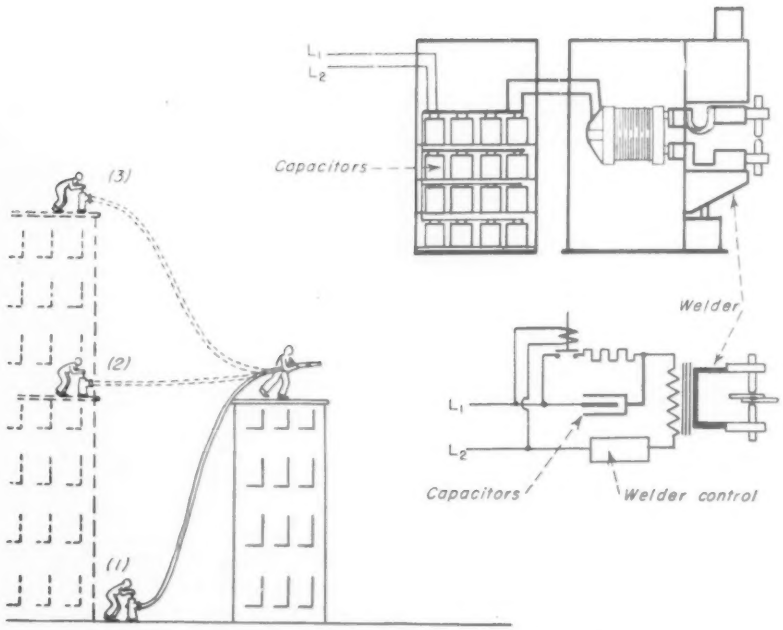
There are many advantages in tilting or constructing the flash-butt welder on an angle toward the operator so that at all times the full work surface is accessible. This permits the operator to position or clamp bulky or cumbersome parts more easily than if they are in a horizontal position. The angle clamping or mounting of parts is quite commonly used for large window sashes, long rods or tubes, special forgings and similar types of products.

The simplest pressure mechanism is the hand-operated pressure application. Hand-operated flash-butt welders and upset-butt welders are usually for general-purpose welding of ferrous metals in relatively low production. The handle is usually of considerable length in order to provide great pressure leverage. The hand-operated mechanism can be one of three types: (A) direct acting on the movable platen; (B) through toggle links and (C) through a hydraulic jack which provides maximum pressure from a hand powered source.

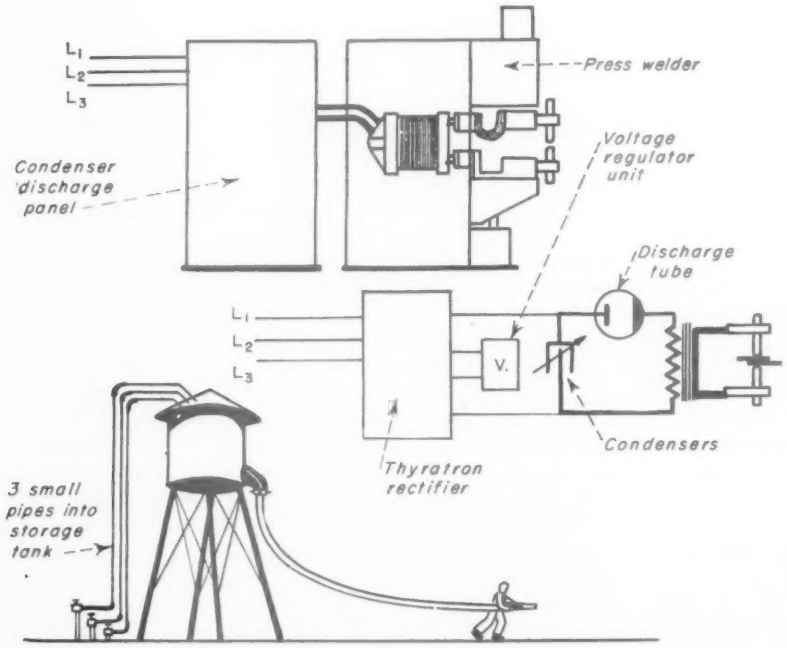
In hand operations, a thumb or automatic trip switch is used to control the current shut-off after the upset is completed. An operator usually becomes so skilled that there almost automatically comes a "feel" of the weld during the heating, burn-off and upset periods. The expulsion of material and the color of the weld area also serve as indicators to determine the need of more or less pressure on the platen.

The same movements described for hand operation may be accomplished with the aid of a motor-driven mechanism. The motor-driven units are generally applied to general-purpose, high-production upset and flash-butt welders in the medium-duty range. The application of pressure is through the moving platen by means of a cam. This cam is revolved by a gear-driven unit—usually a worm-gear reducer—which is in turn driven by an electric motor. Clutch mechanisms govern the precise starting and stopping positions in the rotation of the cam.

For flash welding, the cam has a separate insert block of hardened steel, causing a very rapid and forceful upset movement of the platen and die mechanism at the exact instant



8—SERIES CAPACITORS lessen the power demand by correcting power factor. Current "leads" (position 3) compensate for "lags" (position 1)



9—CONDENSER-DISCHARGE system stores energy much as the tank stores water and dissipates the stored energy at carefully controlled intervals

that the welded parts reach the correct plastic temperatures. The cams operating the moving platens are usually individually made to fulfill the exact requirements of the metal parts being flash welded.

In general, the body of the cam has a relatively uniform rate of rise around to that portion where the upset insert block is positioned. Here the cam effects a very rapid rise in lateral motion, causing the "push-up" or upset for the weld.

Due to the fact that many materials require entirely different rates of rise and upset, the cams must be considerably altered for the welding of different metals. For example, aluminum requires an extremely rapid rate of rise on the cam to accommodate the rapid burn-off during the flashing process and a very steep rise at the upset. In contrast, a relatively small rate of rise on the cam is required for steel bars, and the upset block is less steep than the upset block used for welding aluminum.

One of the short-cuts to accomplish greater efficiency in high production is to have what is known as "double cams"—two identical cams 180 deg apart—instead of a single cam. The principle is to have the cams revolve only one-half revolution in the relatively short movement of the movable platen. The clutch, in this case, engages twice in every revolution of the cam instead of once as in normal operation.

The return motion of the platen is generally accomplished either by springs or by cylinders on motor-driven flash welders. The hand-operated flash welders are usually returned by the same linkage mechanism that effected the pressure application.

The third type of flash welder pressure medium is the air or hydraulic cylinder. In general, air cylinders are used for very high production on ferrous metals and are directly connected to the movable platen as shown. The cylinders are double acting so that both the pressure application and the return movement are effected by the action of the cylinders. A means is generally provided for separately adjusting the platen opening in order that the full stroke of the cylinder may be employed.

If the flash welder is operated by hydraulic pressure, either one of two optional power sources are employed for developing the pressure required: (1) a high-pressure booster system using an air cylinder of large area applying force to a hydraulic cylinder of relatively smaller area with a resulting high pressure in pounds per square inch; or (2) a self-contained hydraulic unit powered by an electric motor driving one or two pressure pumps—a low-pressure pump of high volume and a follow-up high-pressure pump of relatively low volume.

Both air and hydraulically operated cylinders can be hand valve con-

Power Systems

trolled, completely automatic or semi-automatic. Automatic electronic controls provide an adjustable and variable rate of travel on the platen during burn-off and adjustable pressure for the upset. The controls are usually mounted in a cabinet divorced from the welding machine, in order to avoid vibration and other disturbances. Frequently, they are moved several feet from the machine.

Dies and Clamps

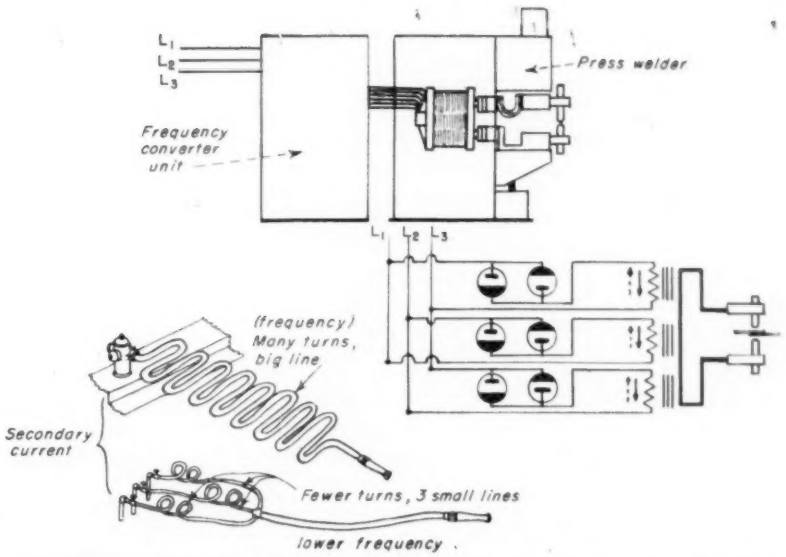
By far the most variable and versatile parts of the flash welder are the dies and clamps mounted on the platens. Such clamps are shown in Fig. 6 for light-medium flash-butt welders. Clamps are usually classified in one of three groups: vertical; horizontal or parallel with the face of the platen of the welder; and the angle-mounted clamp.

Fig. 6 shows the vertically applied lever-action clamp. In sketch (A) is a typical air or hydraulic powered clamping system in which the cylinder is pivoted from its end or center. The lever arms are considerably longer than the clamping section in order to afford a high mechanical pressure advantage.

The perspective view of an average pair of clamps shows that the bearings are as wide and rigid as possible even though the clamping section is narrow. Provision is made for constant alignment of the dies, both vertically and horizontally, despite wear and without the necessity for a complete overhaul of the clamping mechanism.

Often the movable upper clamp is pivoted in order that the clamping can be self-centering unless the work is on round stock such as is shown in Fig. 6 (B).

Dies are often arranged in a specific electrical circuit so that, as in Fig. 7, the lower right die would be energized from one terminal (+) of the welding transformer while the upper left die would be energized through the opposite transformer terminal (—), and the upper right and lower left would be insulated from the current-carrying dies. The reason for this is to avoid concentration of current in the lower or conducting halves of the die, thus producing a hotter area in the bottom



10—FREQUENCY CONVERTER lessens reactance losses by decreasing the number of cycles, represented in the water analogy as loops in the hoses

half of the pieces due to their proximity to the transformer. The upper part of the work and the upper dies receive a smaller amount of welding current and create less heat in the welded parts.

Generally, the clamping medium is operated by separate control from that of the machine control. This permits the operator greater latitude in the individual unloading and clamping of such parts. Usually, there is a foot or hand valve near the center of the welder for convenience in operating these clamps.

Various locating devices are provided, either in the design of the parts or in the tooling of the dies and clamps, to provide for precise location and for consistent burn-off and upset.

One of the most valuable aids in obtaining consistency and exactness in flash-welded products is to prevent slippage during welding by the use of back-ups. These may take many forms, the most common of which is where the work is directly backed up or braced against slippage with adjustable stops. Here the clamping pressure is used solely to conduct the electrical current through the dies and need not be of such magnitude as to bind the parts in order to avoid possibility of slippage. The back-ups can be fixed, manually engaged or power-operated, depending upon the ingenuity of the tooling engineer and the nature of the product.

If the part is of such a nature that it cannot be satisfactorily backed up, higher clamping pressures must be employed on the dies. Such pressure often results in marked surfaces and faster wear on the clamping dies.

Power Systems

The many types of standard resistance-welding machines described in this article fall into one of several categories as determined by the power requirements; namely, a-c transformer machines, stored-energy machines, kinetic-energy machines, etc.

First, consider what is involved in the matter of power requirements. The power from the utility's generating station is first transmitted at high voltages of from 24,000 to 120,000 volts and more through high-tension lines. Various "step-down" stations transform the power to lower voltage for residential use (110 or 220 volts) or industrial use (440 to 2,400 volts) from factory substations. In many cases, however, factories are supplied with ordinary line power at 220 or 440 volts in single-phase and three-phase systems.

The methods by which this power is taken from the supply line may vary considerably. Simple analogies of water supply are used to point up the manner in which electrical current may be taken from primary lines to furnish the proper quantity of energy for resistance-welding systems.

A conventional a-c press-type spot

or projection welder has two heavy primary power lines leading into the welding transformer. The secondary loop is on the opposite side of the transformer core. The electrical energy used at the welding tips is taken directly from the power line as if from a fire hydrant. The amount needed equals the amount taken. There is no storage, delay or change of power.

A-c welders can be equipped with series capacitors to lessen the power demand by a correction of their power factor, illustrated in principle in Fig. 8. At or near the welding machine is a rack containing electrical capacitors, which change the effective electrical reactance of the welding machine. The power factor of the welder may be thought of as the "laziness" of the machine or the "lag" or "delay" of the electrical current alternations in the secondary loop of the transformer in relation to the alternations in the primary lines.

An analogy of this situation is attempted by the illustration of the fireman with the water hose at the building shown to the left of Fig. 8. The water hydrant is located at three different positions on an adjoining building. At position (1) there is a "lag" in time after the water is turned on before it can reach the adjoining building. Correspondingly, there is a lag of pressure and volume between the time the water is turned on at the hydrant and the time it comes out of the hose nozzle.

In position (2), similating "corrected" power factor, the water need not overcome any rise in height and, therefore, flows immediately when the fireman turns on the hydrant. In position (3) the water is "excitable" because of the additional downward force and is "more than ready to flow" when the hydrant is turned on.

Although this analogy does not exactly follow the true electrical system, it does help to explain the lag or delay caused by a low power factor and shows what correction means. The schematic electrical circuit of capacitors is shown at the upper right of Fig. 8.

Stored Energy Systems

In a welding machine of the stored-energy type, the electrical energy of the primary circuit is taken from the power line in small quantities (usually from a three-phase system) and is "stored" in an electrical system. At carefully controlled intervals, the stored energy is dissipated in a single discharge through the transformer secondary to produce the weld.

There are two important advantages of this type of welding. First, instantaneous current requirements are lower than in the a-c system which takes power from the supply lines directly into the transformer, and, secondly, the exact amount of energy needed is stored each and every time, regardless of fluctuations in the primary supply entering the storage system. A consistent welding current is thereby always provided, whereas an a-c welding machine can be only as consistent as the power supply and will be affected by voltage fluctuations in the power supply lines.

The *condenser discharge system* of energy storage is illustrated in Fig. 9. The three-phase supply enters the condenser storage control at L_1, L_2 and L_3, as shown in the upper left, and is stored in the condensers at high voltage after having been rectified through the thyratron rectifier shown in the center.

The schematic electrical circuit in the center of the figure shows a thyratron rectifier which changes the three-phase primary power into direct current at the voltage determined by a voltage regulator unit, marked as "V." The direct current is then stored in the condenser bank and at the given instant, controlled by the firing circuit, the entire charge is dissipated through the primary of the transformer (shown at right of drawing), where it is changed from a high-voltage discharge into a low-voltage, high-amperage discharge through the welding tips.

The analogy of this storage system is shown in the water tank at the lower left of the illustration. The three small water lines (representing the three-phase power lines) are piped into the storage tank, from which the accumulation is released at a given instant as one heavy discharge through the water hose shown in the hands of the operator.

Another form is the *electromagnetic energy-storage system*. Here low-amperage current in a three-phase supply enters the special control unit, where it is rectified into direct current and charged into a reactor-transformer. When the designated amount of energy has been stored by induction, it is discharged through the transformer secondary through the welding tips to produce the weld.

The analogy of this stored-energy principle is exactly like that pictured in Fig. 9; *i.e.*, the water tank with the three individual small water supply lines and heavy output line or discharge line to the nozzle in the hands of the fireman.

Frequency Conversion

Fig. 10 illustrates the system known as "frequency conversion," in which 60-cycle alternating current is changed to a lower frequency such as 8, 12, 16 cycles, etc. The electrical advantage gained in the frequency-conversion system is that the power factor is raised because of the approach of the frequency toward zero. In other words, the lower the frequency the closer to direct current, which means that the secondary loop of the welding machine has lower reactance losses than those encountered with the conventional 60-cycle a-c welder.

A special frequency converter unit connected to the electrical power supply (L_1, L_2 and L_3—three phase) is shown in the illustration in the upper part of Fig. 10. Through a special multiprimary welding transformer arrangement, the output at the welding tips is of lower frequency and higher power factor. The resultant demand on the power supply is proportionately less than that for 60 cycles in accordance with the reduction in frequency.

The process is almost impossible to describe in non-electrical terms. A very poor analogy is attempted at the bottom of Fig. 10. The loops between the nozzle and the fire hydrant are intended to represent "losses" from the reversal of direction. Only resistance can be shown, however, because the water, in passing through the fire hose, is only subjected to resistance. In actual power flow, the reversal in direction of the current also creates a magnetic loss (reactance), but this is impossible to picture.

Batteries and Kinetic Energy

Still another form of stored-energy system is the electrochemical, in which the energy is stored in bat-

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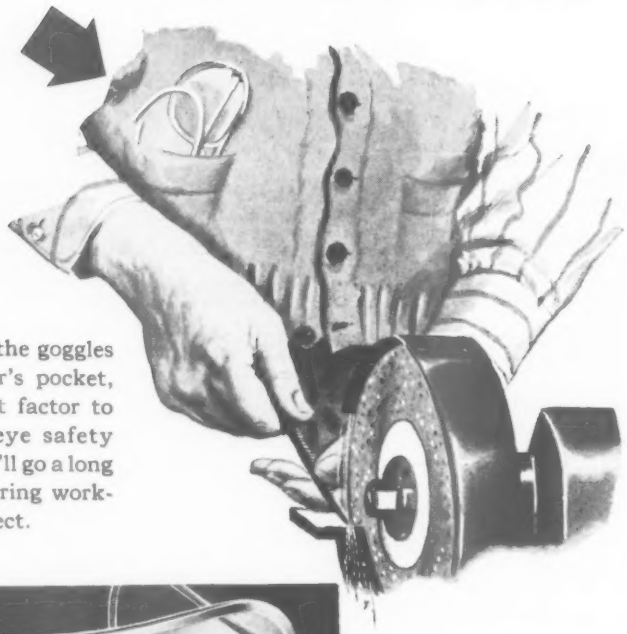
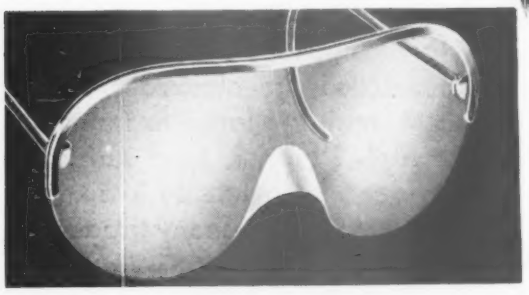
has the remedy!



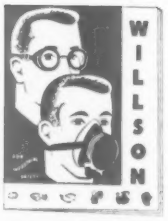
In order to get the goggles out of a worker's pocket, add the comfort factor to protection in eye safety equipment. You'll go a long way towards curing workers of such neglect.



FeatherSpec Style FW2

Here is comfort in nine-tenths of an ounce. WILLSON FeatherSpecs* with a large, overall plastic lens rest lightly on the nose and can be worn all day—even over prescription spectacles—without fatigue. Workers say they hardly know they are wearing any eye protection. Yet they prove adequate protection on many jobs such as light grinding, woodworking, spot welding and inspection of work in process.

If you want your investment in safety equipment to pay off—don't neglect comfort in your specifications.



NEW CATALOG

In addition to product information, it contains information on safety glass, filter glass, respiratory hazards, etc., which will help you select proper safety equipment to meet specific hazards. Send for it!

WILLSON*

"Established 1870"

*®

WILLSON PRODUCTS, INC. • 227 WASHINGTON ST. • READING, PA.

teries. The three-phase power is taken from supply lines in small amounts, rectified by a charger and delivered to the storage batteries.

A special welding contactor constructed on the carbon-pile principle is used between the battery and the electrodes to close and interrupt the d-c flow from battery to welding tips.

It has long been recognized that batteries would be an excellent storage system for electrical energy for resistance welding if a contactor of sufficient capacity could be constructed. Such a contactor has only been realized in very recent years. A special type of adjustable slide resistor has also been constructed for current regulation.

Finally, there is the "kinetic-energy" system, in which energy is stored in the kinetic form (energy of motion) in a rotating flywheel of proper mass and speed. The flywheel is connected to a homopolar generator which will discharge a high-amperage, low-voltage current to the welding electrodes. The contactor required to interrupt currents of this magnitude is again a carbon-pile contactor, similar to that used in the electro-chemical system. The flywheel is driven by a three-phase electric motor at a predetermined speed. The actual discharge of the welding current slows the speed of the flywheel only a trifle, and original speed is regained in the very short interval of time between welds. Succeeding welds are made without dissipating more kinetic energy than can be recovered immediately.

The lowest power demand possible is essential if there is to be increased usage of resistance welders in districts where power supply is critical.

"I think Ed's cracking up!"

Worn Out?

not with NI-ROD in the shop!

Badly worn cast-iron cam. The first beads of Ni-Rod have been laid.

The problem: When this large cast iron cam wore out, it laid up a power shear in the sheet metal plant of McGruer, Fortier, Meyers, Ltd., Montreal, Canada.

Their maintenance men found that the minimum replacement time for the cam would be three weeks. To get the shear back in service sooner, they decided to try repairing.

The solution: The worn camming surfaces were built up with Ni-Rod* and subsequently machined to contour. The Ni-Rod deposit thus formed the new wearing surfaces.

Result? The power shear was back on the job within *3 days* instead of 3 weeks!

This is a *typical* Ni-Rod story — sound, strong, machinable welds in cast iron. Preheating is seldom required. Ni-Rod's easy-to-control arc facilitates cast iron repair work; cuts overhead on tough assignments. It works on both A.C. and D.C.

Check Ni-Rod's superiority in your own shop. Order a 5-lb. package from your nearest INCO distributor. Available in 3/32", 1/8", 5/32" and 3/16" sizes.

*Reg. U. S. Pat. Off.

Worn surfaces have been built up with Ni-Rod.

Cam, after machining. Ni-Rod deposit now forms the wearing surfaces.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall Street, New York 5, N.Y.

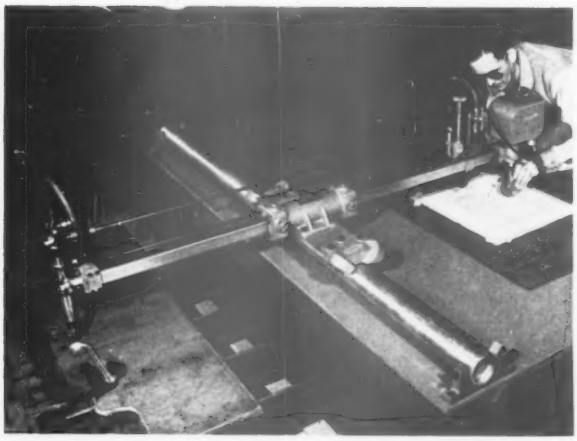
NI-ROD DISTRIBUTORS

Alloy Metal Sales, Ltd.
Robert W. Bartram, Ltd.
Eagle Metals Company
Metal Goods Corporation
J. M. Tull Metal & Supply Company
Pacific Metals Company, Ltd.
Steel Sales Corporation
Whitehead Metal Products Company, Inc.
Wilkinson Company, Ltd.
Williams and Company
Metal & Thermit Corporation
National Cylinder Gas Company—Hollup Corporation

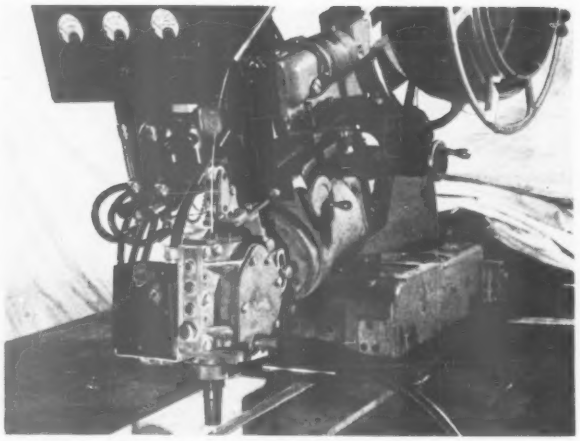
SYMBOL OF SERVICE

SEND FOR FREE BOOKLET ON WELDING WITH NI-ROD

New products fo



TUBULAR RAIL guides new portable low-priced shape-cutting machine. Steel up to 8-in. thick can be cut at rates ranging from 3 to 30 ipm



ARGON METAL ARC welding of aluminum plates up to 1½ in. thick with new Linde machine. 600 amp d-c reverse polarity is used

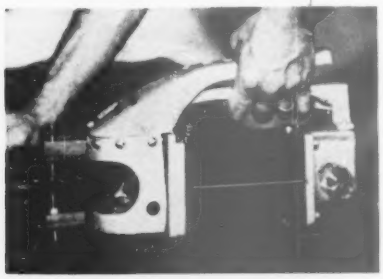
Shape-Cutting Machine

NEW low-priced portable oxyacetylene flame-cutting machine, the "No. 3 Monograph," has been designed for the small shop. It is said to cut steel up to 8-in. thick, in any shape within a 56 by 32-in. area and at speeds ranging from 3 to 30 ipm. Length of the cutting area can be extended by adding tubular rail extensions. Straight-line, circle and bevel cutting jobs can also be handled with accuracy.

Weight of the Monograph is 110 lb, with the tubular rail an additional 35 lb. Unit is packed in a 7 by 1½ ft carrying case which can be handled by two men. Included in the outfit are a manual tracing device, tip, rail, hose, straight edge, radius rod and the carrying case.

AIR REDUCTION SALES CO., 60 East 42nd St., New York City 17.

* * *



UPPER TONG is fixed in new portable spot welder for more exact spot location

Welding Tongs

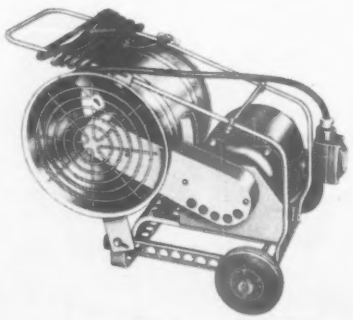
FOR welding steel up to 18 gauge and stainless up to 14 gauge, the "Big Shot" portable spot welder is supplied from a 110-volt power source. A 220-volt unit for welding up to ⅛-in. thickness is also available.

Overall measurements are 4 by 4 by 15 in. and weight is 22 lb. A power control on the welder allows adjustment to various power conditions.

The upper tong is fixed while the lower tong moves to make the weld. This allows the top tong to be placed on the exact spot to be welded. Tongs are of square cross-section to prevent twisting. Electrodes are adjustable up and down and may be purchased in several sizes and alloys.

TOOL AND EQUIPMENT DISTRIBUTORS, 636 South Tenth Ave., La Grange, Ill.

* * *



VENTILATING air for welding in boilers, tanks, etc., provided by portable ventilator

Portable Ventilator

WELDING fumes or noxious atmospheres may be drawn off from welding operations with a new portable ventilator featured by a two-way air flow. The 14-in. diameter, 16-ft long canvas duct may be connected to either the inlet or discharge side of the fan. Ventilator is on a carriage and may be wheeled from job to job.

Up to 32 ft of duct may be connected on the belt-drive models, which are powered by a 1½ hp gasoline engine. Other models are driven by a 115-volt electric motor.

MINE SAFETY APPLIANCES CO., Braddock, Thomas and Meade Sts., Pittsburgh 8.

Argon Metal Arc Welding

NEW argon-shielded metal arc process was announced by Linde at the Metal Show in Cleveland. The arc is maintained in a shield of argon between a continuous filler metal electrode and the aluminum workpiece. Although the process is applicable to either machine or hand welding, the initial effort is being concentrated on mechanized use with Linde FSM-1 machine.

Welding has been performed on aluminum plates ranging in thickness from ¼ to 1½ in. in 2S, 3S, 52S and 61S alloys. Welds made have varied in speed—from 5 ipm in heavy plate to 48 ipm in ¼ in. structural members.

Machine consists of three elements; an electrode feeding mechanism, a gas cup and guide tube assembly and a special voltage control which has a sensitivity of ± 1/10 of a volt. Argon and cooling water flow is controlled by solenoid-operated shutoff valves. A d-c welding generator, preferably of 600 amp rating, is required. Reversed polarity is used. Standard helmet, gloves and suitable clothing must be provided for the operator.

THE LINDE AIR PRODUCTS CO., 30 East 42nd St., New York City 17.

* * *

Belt Sander

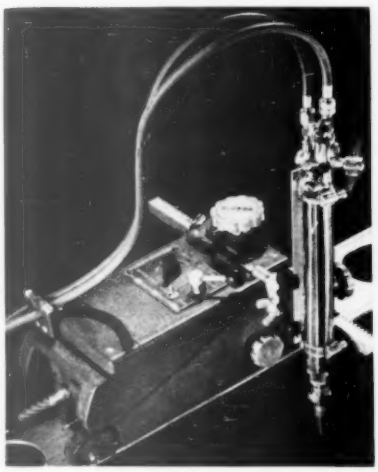
NEW "Thor Silver Line" portable electric belt sander uses endless sanding belts 4½-in. wide by 26-in. long. It is featured by a heat-radiating system said to increase belt life. It includes open-end construction, belt motion creating air currents to carry the generated heat away and heavy-section aluminum fins to conduct heat away to a flat radiating surface on the top housing of the tool.

Sander is available in two models, with or without dust collecting system.

INDEPENDENT PNEUMATIC TOOL CO., 175 State St., Aurora, Ill.

s for welding

A low-cost shape-cutting machine, an argon-shielded metal arc welding head and a magnetic ground for work being welded on turning rolls are featured New Products for metalworking industries



ONE-PIECE cover houses flame-cutting machine. Cutting speed ranges from 2 to 60 ipm

Flame-Cutting Machine

A NEW Victor flame-cutting machine, Model VU-100, is housed in a one-piece cast cover. One control lever for both forward and reverse travel actuates both positive clutch and electric motor switch. This machine may be stopped at any given point and is then in free wheeling for the next positioning. The makers claim that no overrun from motor inertia is transferred to the drive wheels.

A centralized panel controls the unit over a wide speed range from 2 to 60 imp. The grease sealed transmission is direct-driven by an enclosed universal a-c/d-c ball-bearing motor. Semi-oilless bearings are used throughout. The 18-in. rack bar will accommodate one or more torches. Take up gibs give the cross action rack, smooth, rigid operation and a lockscrew is provided to maintain a fixed position.

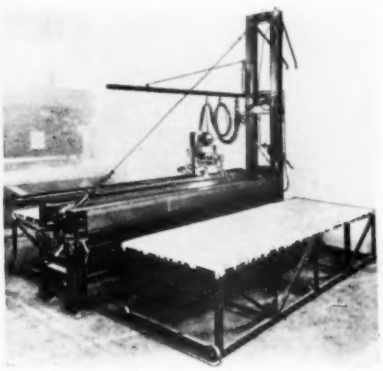
The Model VU-100 is shipped with a rack bar, an adjustable torch block, a universal torch holder, a compass rod and pin and one 60-in. length of track.

VICTOR EQUIPMENT CO., 844 Folsom St., San Francisco 7.

* * *

Inert-Arc Welding Jig

TO FULLY exploit the advantages of the inert-arc welding process, a new welding fixture is offered that is said to assure intimate fit-up of sheet edges to a back-up medium. The unit pictured is capable of



SPECIAL JIG for inert-arc welding has copper bar back-up, adjustable clamps

holding stainless sheets up to ¼ in. thick and 12 ft long. End openings permit welding of longitudinal seams of any formed item with easy removal, the makers claim. For high production, a double-ended swing-type fixture is available.

Dimensions of the swing-type back-up gates can be changed rapidly to accommodate various items. Carriage track alignment can be maintained by adjustment screws.

In operation, the sheets are placed on tables and then pushed into alignment over the relief groove in a copper bar. The bar is in the center of independently actuated clamps, which insure a tight fit of the sheet against the copper.

McHALE MFG. CO., 3200 East Mines Ave., Los Angeles 23.

Courtesy Air Reduction Sales Co.

STAINLESS STEEL can now be welded at high rates of speed by the "Aircomatic" process, which was announced a year ago for welding of aluminum. Deposition rates of 15 lb per arc hour are possible with ¾ in. thick plates welded in two passes. Aluminum bronze for hard-facing applications may also be efficiently deposited by this process

Welding Method

"WELDBRAZING" is the name given to a new welding method claimed to combine the advantages of fusion welding and brazing without the disadvantages of either method. It is based on the discovery of a new type of bond, states its sponsor, and may be used for joining and building up both ferrous and non-ferrous metals and alloys without fusion and with a reduction in heat input.

UNIWORLD RESEARCH CORPORATION OF AMERICA, 1302 Ontario St., Cleveland 13.

* * *

Self-Cooled Solder Hand'e

AN AIR channel inside the handle is claimed to prevent a new soldering iron from overheating or charring. The shank of the iron does not touch the handle at any point, but is held in place by piano wire grips in two places. The length of the shank may be controlled by moving it back and forth inside the handle.

UNIQUE MFG. CO., INC., 226 West Walton St., Chicago 10.

ENDLESS chain of electromagnets contacts work in magnetic ground for turning rolls

Ground for Turning Rolls

NEW MAGNETIC ground for turning roll work is claimed to improve weld quality on boilers, pressure vessels, etc. Contact is maintained by an endless chain of small electro magnets, which may be easily replaced when worn.

The terminal on the ground is tapped for attachment of from one to four terminal lugs on size 4/0 cables. Capacity of the ground is 1,200 amp.

Welds produced with this ground are said to be very clean, since the magnetic influence in the workpiece causes the electrode to flow more evenly and reduce spatter.

Length of the unit is 16 in.; height, 15 in. and width, 7 in. Weight is 34 lb. The basic unit can be installed on any turning roll.

MAGNETRODE CORP., 1708 Main, Kansas City 8, Mo.

PERMANENT magnet in new ground for arc welders sticks to vertical, flat surfaces

Magnetic Ground

A PERMANENT Alnico magnet designed to serve as a clamp for the ground cable of arc welders is called the "MagnaGround." It is attached to the cable with set screws or silver soldering.

The ground can be applied on any ferrous surface, vertical or horizontal. It can also be applied to non magnetic stainless by setting it on top of the work. Small, compact and powerful, with a capacity of 600 amp, this unit may also be used as a holding or welding fixture, say the makers.

DINGS MAGNETIC SEPARATOR CO., 4740 West Electric Ave., Milwaukee 14.

AIR-COOLED handle on solder ladle prevents charring. Redesigned lip aids pouring

Solder Ladle

AN AIR-COOLED wooden handle which can't char or pull off is featured on a new solder ladle. The cutaway handle in the illustration shows the air space around the shank which keeps the handle cool. The handle is easily replaceable, requiring only a screwdriver to attach or remove it.

Lips of the bowl are slightly lower than the rest of the edge while the point of the lip does not form the usual angle but is circular and points downward. This feature enables the user to pour solder either drop-by-drop or in a steady stream, without spilling.

UNIQUE MFG. CO., INC., 226 West Walton St., Chicago 10.

* * *

Welding Rod

FOR SINGLE-CARBON arc welding of galvanized surfaces, "Eutecrod 189" may be used with or without flux. It is said to produce distortion-free welds without damage to the coating and may be used on steel, bronze and copper, maker claims. The rod may also be used with oxyacetylene equipment.

Recommended amperages and carbon sizes for metal thicknesses are: for 20 to 10 gauge metal, a ⅛-in. carbon electrode and 36-60 amps; for 10 gauge to 3/16 in. metal, a 3/16-in. carbon electrode and 60-80 amp; 3/16 to ¼ in. metal, ¼-in. electrode at 80-120 amp.

"Eutecrod 189" has a close color match to most red and phosphor bronzes and requires little or no preheating for thin parts, though heavy bronze castings should be preheated to about 700 F. The rod bonds at 1,550 F and has a tensile strength of 51,000 psi.

EUTECTIC WELDING ALLOYS CORP., 40 Worth St., New York City 13.

* * *

BALL BEARING rollers on revolving shelves increase visibility and access to small parts

Revolving Bins

A new type of storage unit is expected to find many applications in repair shops, welding supply houses, toolrooms, maintenance departments, etc. These new revolving bins are claimed to speed service, increase visibility and availability of stored parts.

Each shelf has a continuous label holder. Up to five additional dividers can be added to separate each bin into smaller openings. The seven-shelf unit is 34 in. in diameter and about 66 in. high, the four-shelf unit the same diameter and 38 in. high, while the counter top unit is 17 in. in diameter and 18⅜ in. high.

LYON METAL PRODUCTS, INC., Aurora, Ill.

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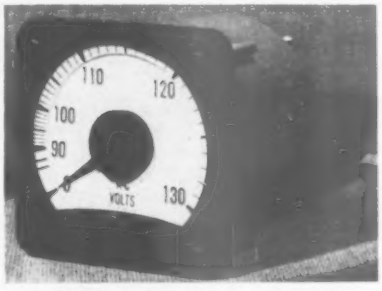


EXPANDED scale featured on new voltmeter for utilities and large industrial users

Voltmeter

A NEW indicating voltmeter with a special expanded scale has been announced for general switchboard use by large industries. The scale is 7.1 in. long, spanning 250 deg of arc. The scale is expanded for easy visibility over the most frequently used range, from 90 to 130 volts.

GENERAL ELECTRIC CO., Schenectady 5, N. Y.

* * *

REJECT CONTROL on new ultrasonic tester ignores small defects in test material

Ultrasonic Weld Tester

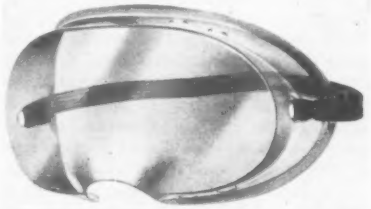
AN improved pattern of square-wave "inch markers" on the screen of the new Sperry "Reflectoscope" facilitates reading of test results, the manufacturers claim. Known as Type UR, Style 50E351 the new instrument replaces the company's previous model, Type SRO5.

A new "reject" control is said to give the operator additional control of sensitivity by rejecting indications of small defects which are allowable in the product under test.

Principle of operation includes the transmission of pulsed ultrasonic vibrations into the test material by means of the searching unit. Welds in steel plates, cylinders, etc., are tested by ultrasonic vibrations which enter the material at an acute angle to the surface. When the vibrations are either intercepted by a defect or reach the other side of the material, they are reflected back to the search unit. The resulting indications on a cathode-ray tube indicate the start of the pulse and reflected vibrations.

SPERRY PRODUCTS, INC., Danbury, Conn.

* * *



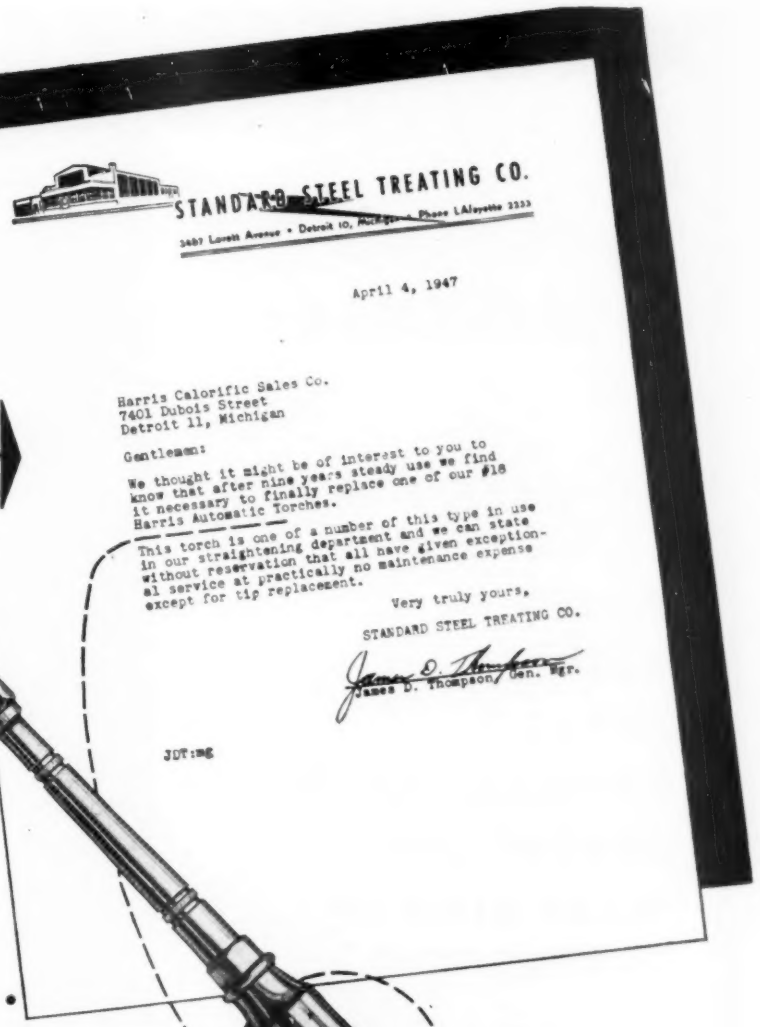
LIGHTWEIGHT plastic goggle fits over prescription glasses. Plastic is non-flammable

Safety Goggle

DESIGNED for light assembly and spot welding, buffing and polishing, the new "Coverlite" goggle weighs under an ounce. Its injection-moulded plastic frame is non-flammable. Clear, light green or dark transparent frames are available. A large air space is left to insure ventilation. The elastic headband is adjustable.

CHICAGO EYE SHIELD CO., 2300 Warren Blvd., Chicago 12.

...after nine years steady use


STANDARD STEEL TREATING CO.
3487 Lovett Avenue • Detroit 10, Michigan • Phone LAfayette 2222
April 4, 1947
Harris Calorific Sales Co.
7401 Dubois Street
Detroit 11, Michigan
Gentlemen:
We thought it might be of interest to you to know that after nine years steady use we find it necessary to finally replace one of our #18 Harris Automatic Torches.
This torch is one of a number of this type in use in our straightening department and we can state without reservation that all have given exceptional service at practically no maintenance expense except for tip replacement.
Very truly yours,
STANDARD STEEL TREATING CO.
James D. Thompson, Gen. Mgr.
JDT:mg

practically no maintenance expense...

To the advantages named in Mr. Thompson's unsolicited letter, important as they are, we must add another that might not be obvious to those who have never used a Harris Automatic Torch. That is, in nine years of continuous operation the thumb control lever (circled at right) must have been actuated many thousands of times. Each and every time it saved money. Using it to restore the full flame from pilot light eliminates the time, motions and gases wasted in flame adjustment of a standard torch. Using the thumb control to shut off the full flame saves oxygen and acetylene that is wasted when the full flame burns but is not applied to work. All these things combine to yield a tremendous return on torch investment.

Harris Distributors, located in all principal Cities, are at your service. There's no better time than now to act!

THE HARRIS CALORIFIC COMPANY

Cleveland 2, Ohio

HARRIS

SERVING THE METAL INDUSTRY SINCE 1905

PAGE WELDING ELECTRODES AND GAS WELDING RODS

WELDING STAINLESS?

○

TO RESIST WHAT?

HEAT?

COLD?

IMPACT?

BENDING FATIGUE?

CORROSION?

WHAT KIND OF CORROSION?

○

NOW ONE MORE QUESTION:

Are you using the best electrode or rod for your purpose?

If you're not too sure, get in touch with your PAGE distributor. Either he knows or he can find out from the PAGE Field Service Man. And the PAGE distributor has a wide selection of Page-Allegheny Stainless Steel rods and electrodes, so that he can give you the one that will serve you best.

ACCO

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PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

Get in touch with your PAGE Distributor

Weight of Wire or Welding Rod

BY W. F. SCHAPHORST, M.E.

ACCOMPANYING nomograph will be found handy for determining the weight of any length of welding rod or steel wire of any specified diameter.

To explain it briefly, a straightedge laid from the wire diameter on column A to the length of the wire on column C will intersect column B at the weight in pounds. Obviously, the chart can apply only to one weight of material—steel. It is useless for brass wire, aluminum, etc. Total length of the wire is given in feet and wire diameter in decimal inches. Since it is more common to specify diameters in such fractions as 1/16, 3/32, etc., a table of decimal equivalents is included below the chart.

For a concrete example, suppose that we wish to know the weight of 360 ft of 3/32 in. wire. Consulting Table I, we find that 3/32 in. is 0.0937 in.—very close to 0.1 in. so we will use the latter value for the sake of simplicity. A straight line is drawn (dotted line) between the points 0.1 on column A and 360 on column C. Since this line cuts the intervening column B at a point a trifle less than 10, the weight of the wire is close to 10 lb. Had we used the more accurate decimal equivalent of 0.0937 in. on column A, we would have found the weight to be a trifle under 9 lb.

If the wire is 36 ft long instead of 360 ft, the weight will be 1 lb instead of 10. Likewise, if the length of the wire is 3.6 ft, the weight becomes 0.1 lb. Simply shift the decimal point of your answer to conform with the shift in decimal point you make in the length. This simple rule will enable you to use any length below 100 ft, the lower limit given on column C.

This chart will give you a rough estimate of such problems as how many ⅛-in. electrodes of standard 14-in. length will be needed to deposit, say, 50 lb of metal. First draw a line or lay a straightedge from 0.1250 (⅛) on column A to 50 on column B. Prolong this line to intersect column C, which will be cut at about the point 1,170 ft. Convert this to inches (14,040) and divide by the standard electrode length of 14. Answer is 1,003 electrodes. Actual calculation, using a value of 0.042 lb per ft for ⅛-in. steel round wire, gives 1,020 electrodes. Neither answer takes into account the deposition efficiency, maximum value of which is 70% (see Data Sheet No. 8, THE WELDING ENGINEER, May, 1941).

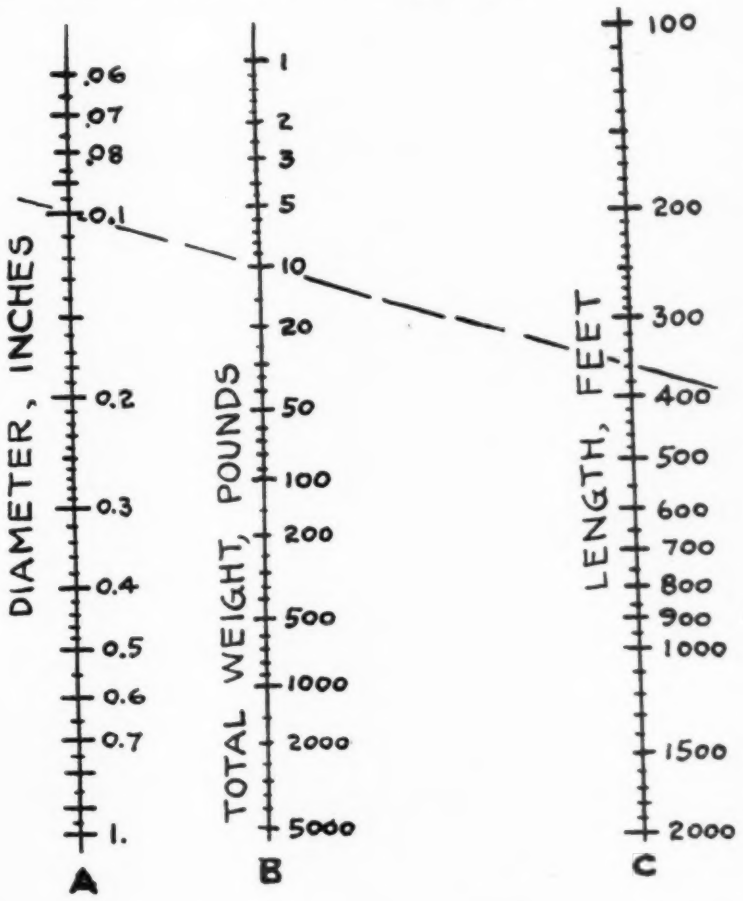
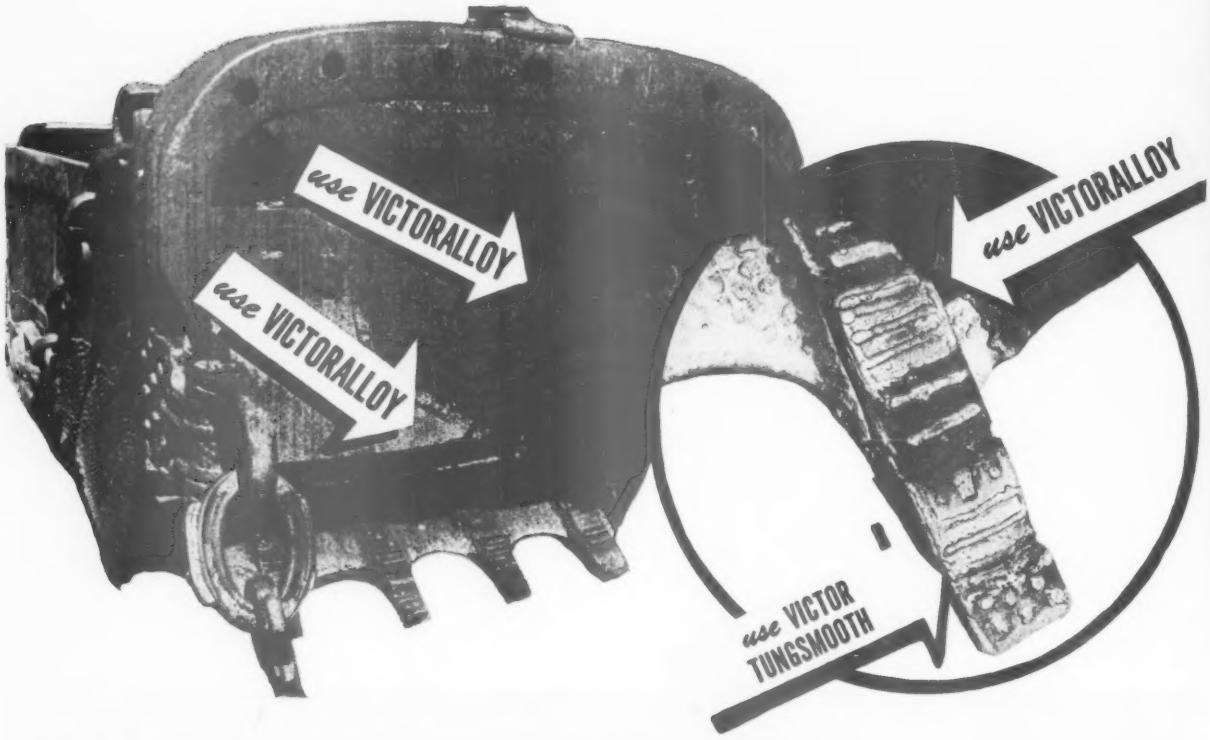


Table I. Decimal Equivalents, Inches

Fraction	Decimal Equivalent	Fraction	Decimal Equivalent
1/32	0.0312	17/32	0.5312
1/16	0.0625	9/16	0.5625
3/32	0.0937	19/32	0.5937
1/8	0.1250	5/8	0.6250
5/32	0.1562	21/32	0.6562
3/16	0.1875	11/16	0.6875
7/32	0.2187	23/32	0.7187
1/4	0.2500	3/4	0.7500
9/32	0.2812	25/32	0.7812
5/16	0.3125	13/16	0.8125
11/32	0.3437	27/32	0.8437
3/8	0.3750	7/8	0.8750
13/32	0.4062	29/32	0.9062
7/16	0.4375	15/16	0.9375
15/32	0.4687	31/32	0.9687
1/2	0.5000	1	1.0000

TO PUT *NEW* LIFE INTO WORN EQUIPMENT,

use VICTOR Hard-Surfacing Rods



	FOR THESE CONDITIONS	FOR SUCH EQUIPMENT
VICTORALLOY	Abrasion and severe impact	Tractor rollers, dredge pump impellers, bucket lips and teeth, rock crushers, steel mill wobblers
VICTORTUBE AND VICTORTUBE "SPECIAL"	Severe abrasion	Scarifier teeth, dredge cutter blades, posthole augers, oil field tools, ditcher teeth
VICTORITE	Earth abrasion or sliding friction	Plowshares, cultivators, steel mill guides, cement chutes, shaft bearings, rolling mill guides
VICTOR HS 1	Corrosion, heat and abrasion	Saw-teeth, carbon scrapers, wire guides, rocker arms
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VICTOR TUNGSMOOTH	Thin cutting edges	Coal cutter bits, brick augers, pug-mill knives, screw conveyors

Made for both acetylene and electric AC and DC application. Get your supply from your VICTOR dealer NOW.

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Use America's fastest electrodes to cut your production time and costs

The DH-2 6020 electrode can't be beat when it comes to speed. Test it yourself against any electrode—you'll see what we mean. In addition to cost-cutting speed, the DH-2 has these important features.

Good appearance—smooth uniform bead.

Both medium and deep penetration — just change your amperage and travel speed.

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No spatter and easy slag removal — you save production time and money all the way around.

Works on AC or DC welders.

The DH-2 is a down-hand rod. Use it to lower your costs on horizontal, flat, fillet, or groove welding.

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WELDING ELECTRODES

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HARNISCHFEGER CORPORATION

CONVENTION NOTEBOOK

(Continued from page 22)

of frequency-changer welders in sufficient detail to help the user to decide whether or not such a welder should be used for a particular job. Formulas were given for predicting the electrical performance of frequency-changer welders on the basis of design data.

Portable Resistance-Welding Tools by Charles H. Davis, Jr., welding process engineer, The Budd Co. This paper discussed the design and fabrication of portable welding tools to meet specific conditions of manufacture.

Basic Research

No account of the convention would be complete without mention of the many fine research projects which are adding to our store of welding information. Five papers in particular appealed to the writer as being truly outstanding:

High-Energy Loading Method of Testing Steel Plate and Weldments by G. S. Mikhalapov, Metallurgical Research and Development Co., Inc. This paper discussed a new method of producing shock impact for test purposes by using carefully measured charges of an explosive compound. The explosive was placed above the test plate, which was supported on all four of its edges by a rectangular framework of steel bars. Two types of failures were encountered: ductile and brittle. The ductile failure is essentially a round hole punched through the test plate. The brittle failure shows no deformation; the plate simply falls to pieces in extreme cases. An interesting observation with regard to welded plates is that the fracture starts at the weld but does not travel through the weld but through the parent plate. The reason is not known. Fractures always took place at right angles to the weld on steels brittle at low temperatures.

Tests of Specimens Simulating Weld Heat-Affected Zones by Ernest F. Nippes and Warren Savage, Rensselaer Polytechnic Institute. Using information obtained from previous studies of time-temperature relationships near an arc weld, suitable cams were made to duplicate several of the heat-affected structures associated with arc welds in ½-in. silicon-killed steel plate. The time-temperature control device was employed to produce specimens of each structure for impact testing. A region exhibiting abnormally low impact properties was discovered well outside the normally considered heat-affected zone of an arc weld.

Measurement of Flux Densities in Steels by T. E. Hamill, Naval Gun Factory. One of the most thought-provoking papers on magnetic-particle inspection in many a day! Mr. Hamill described a newly developed method for determining the flux density at the surface and up to 5 in. below the surface in steels magnetized with direct current. It is thus possible to explore a prototype welded section or casting thoroughly and then set up dependable inspection procedures based on exact knowledge. The test instrument is a gaussmeter with a hollow bronze rod, either 1¼ or 5 in. long, protruding from its back. Holes 0.105 in. in diameter are drilled in the material for insertion of the rod at depths regulated by using a brass bushing containing an adjustment screw.

Arc-Welding Metal Transfer Analyzer by R. C. McMaster, D. C. Martin and A. Leatherman, Battelle Memorial Institute. An analyzer involving no electronic tubes or delicate components was built by the bright boys of Battelle in order to find out just what is happening in the welding arc. It is known that whenever a globule of metal bridges the gap, the arc is short-circuited, and this new instrument counts the number of short circuits occurring in a designated interval of time and measures their duration in milliseconds. Studies carried on with the new analyzer revealed an inverse relationship between arc voltage and number of short circuits—the lower the voltage the more short circuits. Current magnitude, however, has little or no influence. The number of short circuits was greatest with bare-wire electrodes, fewer with E-6012 electrodes and fewest with E-6010.

Heat Effects in Anode Spots of High-Current Arcs by T. B. Jones, assistant professor of electrical engineering, Johns Hopkins University. Dr. Jones and his associates who helped prepare this paper are particularly interested in current density—defined as amperes per square centimeter—at the point where the welding current enters. Their method of securing such data was to employ a high-speed moving electrode technique. The moving electrode or anode was a spirally wound metal tape mounted for rapid rotation on a lathe. The fixed electrode or cathode was a ¼-in. carbon electrode inserted in the tool carriage of the lathe. At high speeds, the arc would jump and form spots—tiny needle-like hills—on the anode tape. By measuring the formation of these spots, it is possible to get a picture of current densities. Current densities of 12,000 amp per sq cm were measured, with indications of even higher values. Both current density and electrode melting rate were found to be dependent on the relative speed of the electrodes, a fact which may prove of significance in connection with arc cutting and automatic welding.

Inert-Gas Welding

Those interested in inert-arc welding, whether by the conventional tungsten electrode or the newly developed consumable-electrode method, were given ample food for thought in the four papers presented at the session on this subject. R. H. Bennewitz, The Linde Air Products Co., told how the process is being used (tungsten electrode with argon shielding gas) by the auto industry in the production of front fenders, bumpers, bumper guards and now auto bodies themselves. F. J. Pilia was co-author of this paper.

A paper prepared by A. Muller, G. J. Gibson and E. H. Roper, all of Air Reduction Sales Co., reviewed a year's developments in inert-gas *metal-arc* welding with consumable electrodes. This process, developed originally for aluminum, has now been applied to stainless steel and other alloys including aluminum bronze. It has also been used for depositing overlays of other metals on mild steel.

H. O. Jones, another Air Reduction engineer, described the development of mechanical and automatic equipment for welding by the conventional tungsten-electrode process. The filler wire is fed at speeds of from 50 to 200 ipm, and products varying from small hypodermic needles to jet engine components can be welded by this method. Disturbing magnetic influences in the jig are

now being overcome by producing a special magnetic field around the tungsten electrode.

M. J. Conway, General Electric Co., presented facts to show that helium, the neglected stepchild of the inert-arc process, is about to emerge as a glorious Cinderella. He debunked the well-known fiction that argon being heavier than air will fall and blanket the weld whereas the lighter helium will rise. The truth is that both gases tend to rise in the heat of the welding arc, and little difference in the rate of rise can be noted. Helium has been used successfully with direct current straight polarity in the welding of stainless steel, Inconel, Monel, copper and high-copper alloys, silicon bronze and some brasses. It has not been used to any great extent in the arc welding of aluminum because it requires a flux, but experiments in a-c welding with helium, now being carried out by the U. S. Bureau of Mines, may change this picture.

Flame-Cutting

Four very good papers were presented on flame-cutting, and it is to be regretted that there isn't more space to discuss them. New developments in cutting machines were covered by Walter Begerow, of Air Reduction, in a paper prepared jointly with A. H. Yoch of the same company. William O. Springer, Joseph T. Ryerson & Son, Inc., told how the steel warehouse can use electronic tracers to speed shape cutting; Ryerson has lately installed 12 flame-cutting electronic tracing devices. James T. Lewis, Lewis Welding & Engineering Corp., Bedford, O., described in detail the set-up of flame-cutting equipment for a job shop. C. W. Powell, Republic Steel Corp., revealed how the powder-cutting process is being used for scarfing of austenitic stainless steel ingots removed from the mill because of bad surface defects. Both austenitic and ferritic stainless steels are cut by this process as are lower alloy steels of extra-heavy section such as ladle skulls and ingots.

To sum it all up, it was a swell convention. High tribute must be paid to the 109 authors and co-authors of papers, to all members of the Convention Committee and to the Society's national officers, staff officers and directors.

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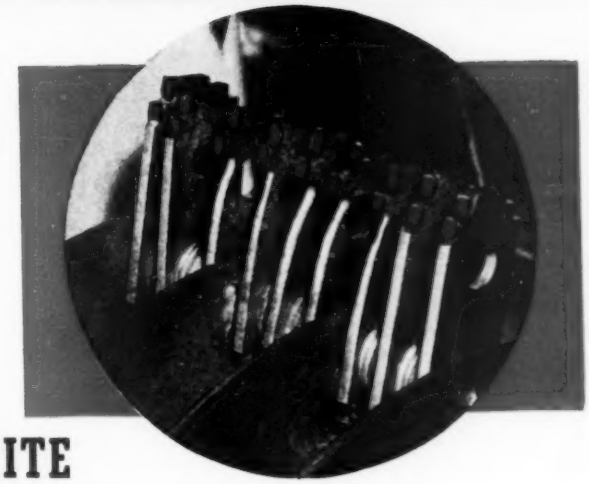
Amsco® WELDING PRODUCTS



TUNGSITE
Tungsten Carbide
INSERTS

FOUR WEEKS—*instead of only four days*—now that these hammers are tipped with Amsco Tungsite Inserts! Imagine how this 500% longer hammer life, with its reduction in machine repair and down time, has cut the costs of pulverizing asphalt roofing trimmings.

Amsco Tungsten Carbide welding products are available as Inserts . . . or as Tungrod and Tube Tungsite hardfacing rods and electrodes. To meet all job needs . . . Inserts are available in a wide range of shapes and sizes . . . and Tungrod and Tube Tungsite are supplied in a variety of mesh sizes. Recommended for resistance to extreme abrasion, or when a serrated cutting edge is required. Outstandingly successful on rotary drill bits, plow shares, cane knives, muller plows, pug mill knives, hammermill hammers and similar parts.

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"Hard Surfacing by Fusion Welding."

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Foundries at Chicago Heights, Ill., New Castle, Del., Denver, Colo., Oakland, Calif., Los Angeles, Calif., St. Louis, Mo.
Offices in principal cities. Made and sold in Canada by Canadian Ramapo Division of Joliette Steel Ltd., Niagara Falls, Ont.

NEWS OF WELDING AND WELDING MEN

Central Zone NWSA Meeting Attracts 90 Delegates

THE LARGEST audience ever to be present at a central zone meeting of the National Welding Supply Association attended the October 20 meeting at the Hotel Hollenden in Cleveland. Delegates numbered 90, a few of whom came from as far away as New York and California. E. C. Caluwaert, O. K. I. Welding Supply Co., Cincinnati, vice-president, representing the central zone. Discussions during the morning were led by Howard Unger, Kankakee Welding & Supply Co., Kankakee, Ill., and Frank B. Findley, Findley Welding Supply, Inc., Youngstown, O. Mr. Unger delivered his views as to how the manufacturer can assist the distributor's sales effort. Mr. Findley conducted a review of the methods NWSA members are using to keep accounts receivable within reasonable limits.

Following luncheon, Robert Oswald, president, James B. Oswald Insurance Co., Cleveland, spoke on "Insurance Requirements for the Welding Supply Distributor." The various types of insurance recommended for welding businesses were reviewed.

Harry M. Johnson, manager, Wayne Welding Supply Co., Inc., Fort Wayne, Ind., outlined the methods his firm has found effective in training outside and over-the-counter salesmen. R. H. Newton, manager of dealer sales, The Lincoln Electric Co., Cleveland, discussed the functions his firm considers essential in selecting its distributors.

R. C. Fernley, secretary-treasurer of the association, gave a review of the current association activities and pointed out that there are now 161 members, with a gain of 82 members in the past year. The association has more than doubled its membership. There are 106 distributor members and 55 manufacturer members.

Next meeting of the NWSA will be held in the central zone at Kansas City, Mo., Nov. 10. A southeastern zone meeting will be at Atlanta, Ga., on Dec. 6 and a southern zone meeting at New Orleans, Dec. 7.

* * *

NCG Installs Oxygen Plant To Serve Carolina Area

AN OXYGEN-producing plant has been installed at 2414 South Boulevard, Charlotte, N. C., by the National Cylinder Gas Co., Chicago. The new building includes office, storage space and modern sales rooms.

* * *

Whitehead Metal Products Appointed Amsco Distributor

AMERICAN Manganese Steel Division of American Brake Shoe Company has appointed the Whitehead Metal Products Co., Inc., as distributor of its complete line of Amsco welding products. The line consists of rods and electrodes for hard-facing and repair work, including the tungsten carbide type.

The Whitehead Company operates warehouses in major cities in New York, New Jersey, Pennsylvania, Massachusetts and Maryland.

* * *

Photo Courtesy Tube Turns, Inc.

LIGHTWEIGHT swing line for filling oil tank cars made from welded 3S-F aluminum alloy piping and fittings. All-aluminum assembly weighs 42 lb; conventional steel, 129 lb. Welding was by inert-arc method

Test Tubes to Take Mechanical Abuses

NEW kinds of rugged electronic tubes are being developed from test analyses to operate properly under severe mechanical abuses. The methods of testing for sturdiness and durability in electron tubes are described in Technical Report 1366, National Bureau of Standards.

Tubes are often tested by continuous vibration for periods of several days to produce fatigue failures at the points of weakness. Such failures usually occur in filaments and cathode coatings. Improperly welded joints are another frequent source of trouble. When the tube is operated under vibratory conditions, flashovers between electrodes may occur. Other types of tests are mechanical resonance, high impact shock and centrifugal acceleration.

At present the cost of rugged tubes is about three or four times more than conventional tubes.

* * *

Welded Bridge Contest Announced by Lincoln

SECOND "Welded Bridges of the Future" Program is being sponsored by the James F. Lincoln Arc Welding Foundation, Cleveland. Competition was opened Nov. 1 and extends until June 30, 1950.

Bridge to be designed is a two-lane through-highway bridge with a span of 250 ft. Type of steel and the loading conditions for the bridge are specified, but designers may use any steel shape, any fabricating or erecting method and may change existing specifications if in line with good engineering practice.

Rules and conditions for the program have been prepared with help of a committee consisting of prominent bridge engineers and designers in leading universities, consulting firms and fabricating companies. Honorary chairman of the committee is Wilbur M. Wilson, emeritus research professor of structural engineering, University of Illinois.

* * *

New Electrode Plant Opened at Flushing, N. Y.

A steel ribbon was severed with a metal-cutting electrode in opening the new Flushing, N. Y., plant of Eutectic Welding Alloys Corp. The 400 visitors attending the ceremony were given their first look at the recently announced training school. The Eutectic Welding Institute, and were then shown through the laboratories, foundry, chemical division, extrusion press department and the film section in a plant tour.

* * *

Fred Haggerson Awarded ASM Research Medal

THE 1949 Medal for the Advancement of Research was presented at the recent annual banquet of the American Society for Metals to Fred H. Haggerson, president of Union Carbide and Carbon Corp., New York City.

Mr. Haggerson was cited as an outstanding example of an industrial leader who has advanced technological progress by employing industrial research. A considerable part of this research has been metallurgical in nature, dealing with new alloys and their properties as well as welding methods and the application of oxygen and acetylene in steel making.

* * *

Welded Alloy Piping Withstands 10,000 psi

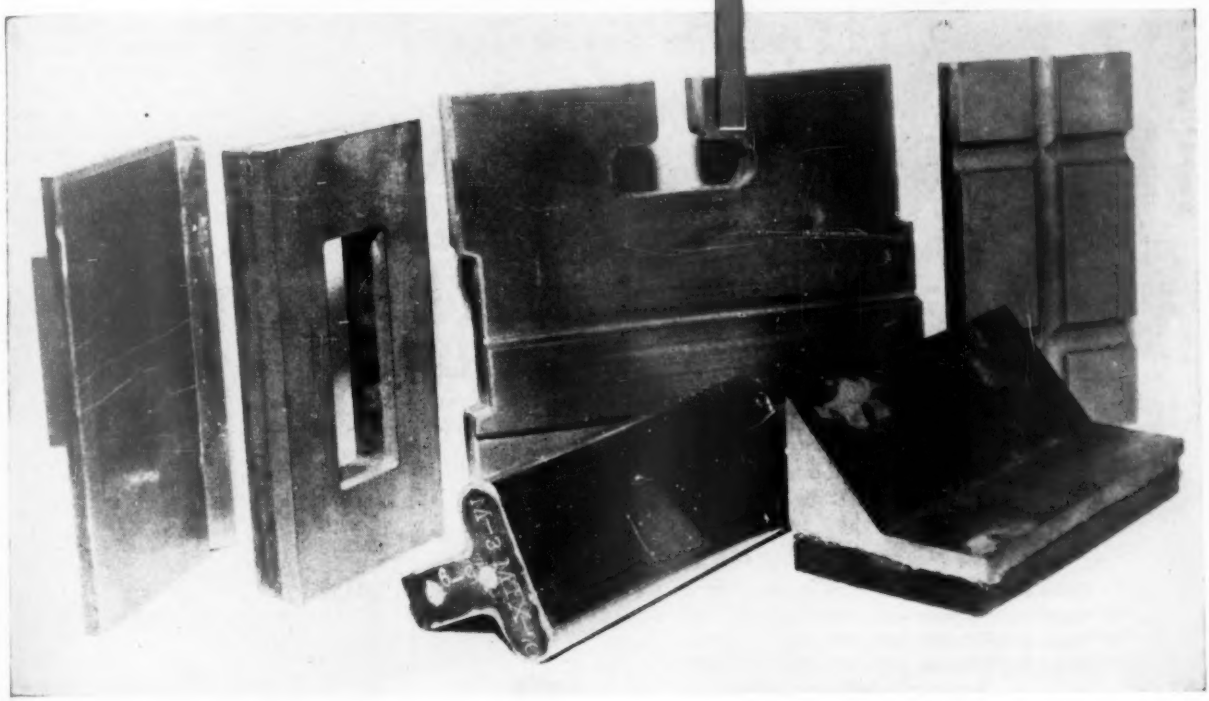
PIPING systems for the new coal-to-oil demonstration plants recently opened by the U. S. Bureau of Mines at Louisiana, Mo., have been designed for operation at 10,300 psi at 1,000 F. Steel used for the welded tubing was developed by The Babcock & Wilcox Tube Co., Beaver Falls, Pa. It is a chrome-nickel-moly austenitic stainless with high creep strength. The high pressure and temperatures necessitated a wall thickness of 1.169 in. in a tubing of 4 25/32 in. OD.

The two plants, situated approximately 100 miles north of St. Louis on the Mississippi river, will employ two different processes for the conversion of coal and lignite into a full range of synthetic liquid fuels.

Hard-Faced

BRICK & REFRACTORY DIES OUTLAST ORIGINALS 30 TO 1!

A typical example of increased production and lower costs when wearing equipment is protected with **STOODY ALLOYS**



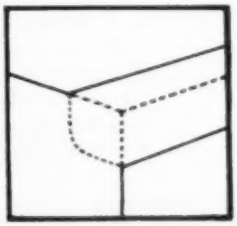
- ✓ *Dies hard-faced with Stoody 6 last up to 30 times longer.*
- ✓ *Low cost, 1020 steel eliminates use of expensive tool steels.*
- ✓ *Easier, faster machining on intricate dies.*
- ✓ *No heat treatment necessary.*
- ✓ *Attendant warpage problems eliminated.*

On comparative tests, conventional, unprotected dies wore beyond usefulness after producing 10,000 pieces. Stoody Hard-Faced dies produced 340,000 pieces under identical conditions. Thereafter worn die areas were touched up with an additional output approximating the original run.

This is another cost-cutting example of Stoody Hard-Facing Alloys in industry. If wear is causing damage on your equipment, get in touch with your Stoody Dealer. His suggestions are furnished gladly.

APPLICATION INFORMATION

Best support for alloy on die edges is obtained by chamfering back ¼" with ⅛" radius in corner. Build back to size with Stoody 6 applied with oxy.-acetylene torch for smoothest deposit and maximum density. Deposit can be hot-filed to approximate size before grinding.



STOODY COMPANY

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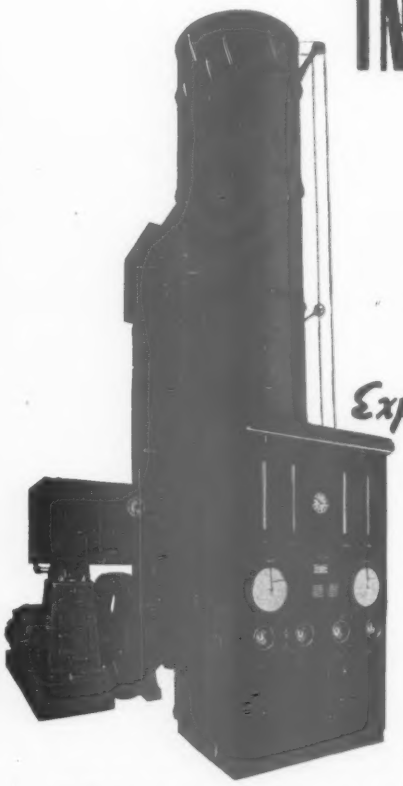

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15 Meters or 530 cubic feet	75 Meters or 2650 cubic feet
30 Meters or 1060 cubic feet	100 Meters or 3530 cubic feet
40 Meters or 1412 cubic feet	150 Meters or 5300 cubic feet
55 Meters or 1940 cubic feet	200 Meters or 7060 cubic feet

Larger sizes also available

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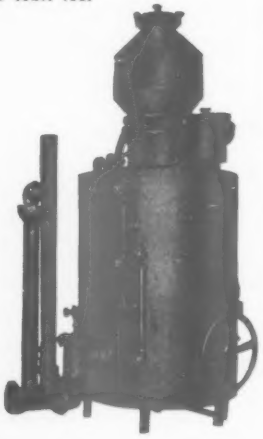

This 600-lb. Acetylene generating Plant is one of the safest plants manufactured. Automatic controls minimize the operating personnel. Capacity 2700 cu. ft. per hour. Generator only is illustrated. Affiliate units are designed to insure maximum production at minimum costs. Complete details of construction and plant layout on request.

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Eutectic Organizes Merchandising Division

EUTECTIC Welding Alloys Corp., Inc., New York City, has established its new "Allotemp" division for the purpose of handling "Economizer" containers of labelled welding alloys. To date, 18 different types of Economizers have been marketed, according to Rene D. Wasserman, president of the firm. A special chart on the back of the display rack is used to get quick answers when customers ask what to use to weld a material.

* * *

Fire Damages Welding Shop

STRUCTURAL steel plant of the Pacific Car & Foundry Co., Seattle, was damaged by fire on Oct. 20 to the extent of $20,000. The welding shop was gutted and the main steel shop damaged to a lesser amount. The blaze was thought to have started in the tool and compressor room, which was also destroyed. The company had previously begun construction of a $300,000 addition to diversify its steel fabricating facilities.

* * *

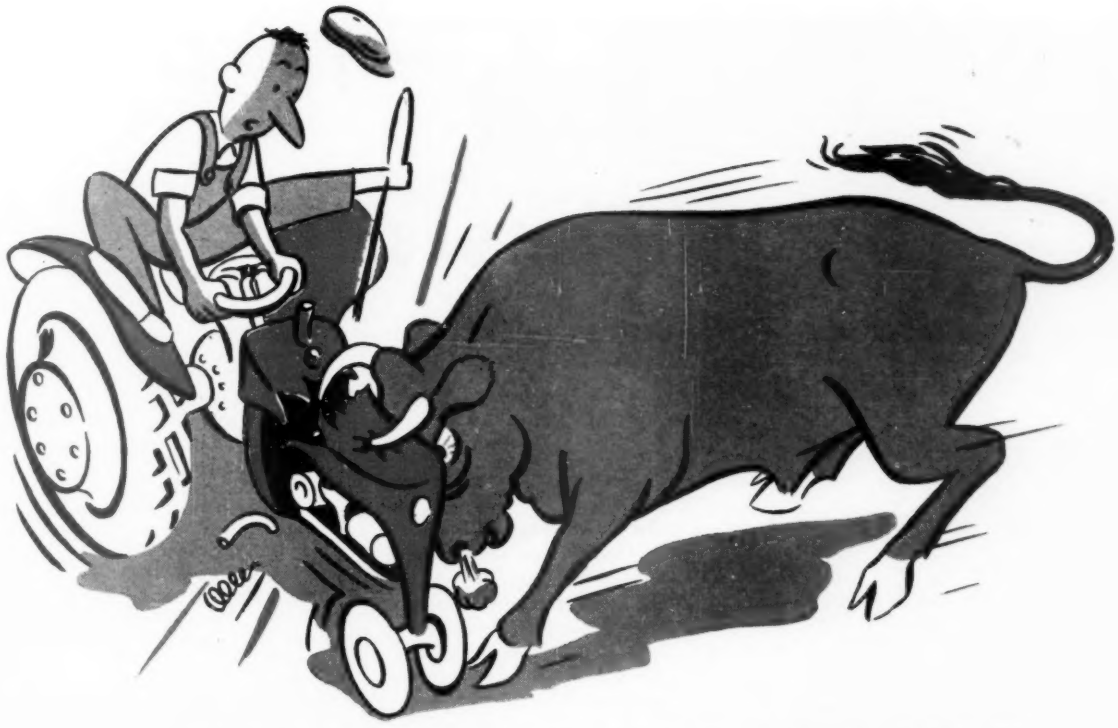
Photo Courtesy The General Electric Co.

ELECTRONIC detector checks welds on gasoline tanks for heavy-duty freight trucks

Fuel Tanks Seams Tested by New Detector

WELDED fuel and traction tanks produced by the Lintern Corp., Berea, O., are being tested with a new type of leak detector so sensitive it can discover leaks small enough to release one ounce of gas in a century.

Fuel tanks for use in large trucks are turned out by six weldors and one inspector at the rate of 18 per day. Fabrication is in six stages. The 85 to 150-gal tanks are placed on iron rails rather than positioners so that they can be pushed from one welding booth to another along the assembly line. Top plates of tanks are mild steel deck plate; the bottoms and ends are 12-gauge sheet steel. Weldments are ⅝ in. wide, and 60 ft of electrodes are used on each tank.



HAVE YOU A FRACTURE PROBLEM? DON'T WORRY—

WELD IT IN A HURRY WITH REVERE #456 BRONZE WELDING ROD

THE "FLAME-TESTED" ROD IN THE DISTINCTIVE RED, WHITE AND BLUE PACKAGE

From the smallest fracture to the largest, here's how you can save 3 ways by using Revere #456 Low Fuming Bronze Welding Rod:

1 **FASTER PREPARATION**—Time is saved in preparing the parts to be joined as the high strength of Revere #456 permits wide assembly tolerances, yet provides strong, neatly-finished joints.

2 **NO HIGH PRE-HEATS AND POST-HEATS**—You save on the time and fuel costs involved in pre-heating because the low melting point of Revere #456 (about 1600° F.) reduces the need for high pre-heats and post-heats.

3 **LESS "CLEAN-UP"**—Because it is low fuming Revere #456 enables you to get more accurate placement of the weld metal and thus saves on "clean-up" costs.

Next time you have a fracture problem in cast or malleable irons, wrought iron, cast or wrought steel, cast or wrought bronze, try Revere #456. Once you've worked with this "flame-tested" rod you'll see how it cuts costs, saves time and gives better results. Make Revere #456 prove itself. Order a package today.

Other Revere Welding Rods are: Revere Bronze 380, Manganese Bronze, Herculoy, Phosphor Bronzes, Brass (Brazing Rod) Silicon Deoxidized Copper and Electrolytic Copper. All come in 100-pound cases or in 25-pound cartons, net weight, and are stocked by Revere Welding Rod Distributors in all parts of the country. Write for folder giving technical data.

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BACK VIEW

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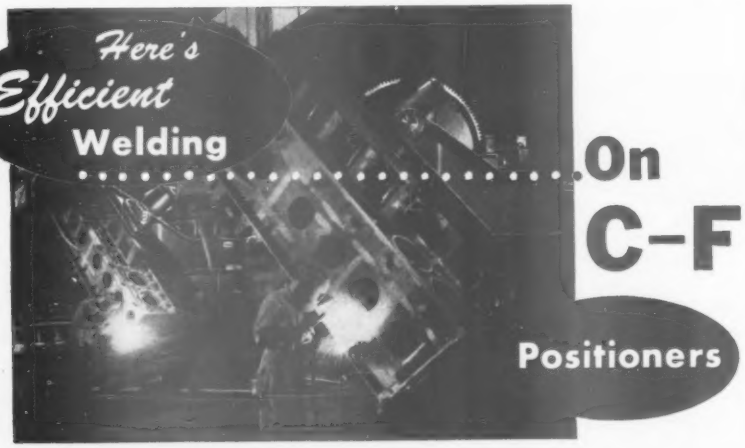

When heavy, unwieldy weldments like these diesel crank cases can be quickly swung into any position so that every weld is made **downhand**—that's efficient welding!

Weldors spend more time welding—do better welding at lower cost when they work with C-F Positioners because these hand and/or power operated machines reduce positioning time to a minimum. Investigate the cost-saving advantages of C-F Positioners. They pay their way in any company.

Write for Bulletin WP24—an illustrated circular detailing the **Specific** advantages of C-F Positioners.

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C-F positioned welds mean better, more economical welds

Students Trained By Bureau of Standards

THE Bureau of Standards has established an integrated work-study program, beginning at the college sophomore level, for the training of research scientists and engineers. This program permits the student to alternate periods of full-time study with actual work experience in his chosen field. At the same time it enables the bureau to select promising students, upon graduation, for permanent appointment.

There are three programs of interest to college students: the internship program for undergraduates, the regular training program for college graduates on the staff, and the fellowship program for graduates engaged in working for advanced degrees.

For the college undergraduate with two years of engineering, the position of "Student Aid" is open upon the basis of a test of general ability, which also qualifies him for permanent professional appointment after graduation. Those who have credit for two years of college receive a salary of $208 per month for a three-month period during the summer vacation. Before returning to complete his college work, the successful trainee is asked to indicate the work he would like on a more permanent basis after graduation. Every effort is made to place him in a position of his choice before he returns to school to complete the requirements for his degree.

Upon full-time appointment to the bureau's professional staff, the young scientist or engineer is given an indoctrination course, consisting of two hours per week for 15 weeks, designed to supplement his academic training. The training program includes instruction in special technical skills, the proper use of periodical literature in his own field and useful habits for work, study and thought.

A limited number of research fellowships are available and may be filled by graduate students, providing the work done is used in fulfilling the thesis requirement for an advanced degree. The stipend is $2,974 per year.

• • •

We're Sorry!

"Mr. T. B. Jefferson, Editor
"The Welding Engineer, Chicago
"Dear Mr. Jefferson:

"In the October issue of THE WELDING ENGINEER you carried an article stating that the Veterans Administration had cancelled their contract with this school. Your statement is not true since we completed our contract June 30, 1949, but did not renew same owing to a government directive, regulating salaries in a private corporation, which we considered unfair.

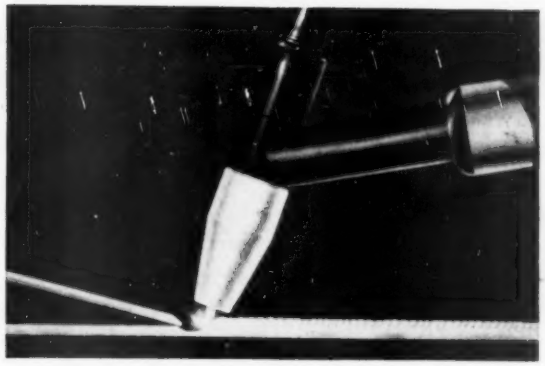
"Our relationship with the Veterans Administration had been a happy one as far as the training section was concerned, and we enjoyed our association with the G. I.'s. The fact that we did not continue under the bill was due to the aforementioned directive.

"We sincerely hope you will make a correction in your magazine in the near future.

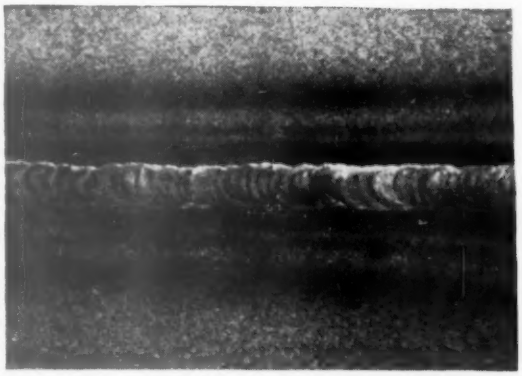
"Edward T. Scott (signed),
"President, The Cleveland School of Welding, Inc.,
"Cleveland 15."

Weld Sheet Steel with the HELIARC torch

Trade-Mark



and wipe out one complete operation



AS WELDED — *This photograph, unretouched and natural size, shows that* HELIARC *welds in sheet steel are clean and uniform.*

There is no spatter or flux, so you save cleaning costs when you switch to the HELIARC process for welding sheet steel. And you keep the advantages of high speed, and minimum distortion that are characteristic of arc welding. Any manual arc or gas welding operator finds welding with a HELIARC torch easy to master.

Porosity-free welds in killed low-carbon steel up to $\frac{1}{8}$ in. thick can be made with this process. In non-killed grades, welds are as nearly gas free as can be produced by any welding process. Argon-shielding prevents pick-up of atmospheric gases. No argon is dissolved in the weld.

Joints welded with the HELIARC torch will not show under paint, lacquer, or even vitreous enamel finish. It takes only a light grinding to remove the low, smooth ripple and make the bead flush with the surface.

Get more information on this fast, clean, welding process from any LINDE office. Let us show you how it can improve your product and cut your costs. Just fill in the coupon.

The terms "Linde" and "Heliarc" are registered trade-marks of The Linde Air Products Company.

THE LINDE AIR PRODUCTS COMPANY
Unit of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada:
DOMINION OXYGEN COMPANY, LIMITED, Toronto

THE LINDE AIR PRODUCTS COMPANY
30 East 42nd Street, New York 17, N. Y.
(or your nearest LINDE office)

Gentlemen: We would like more information on welding sheet steel with the HELIARC torch. We manufacture ..... (Product)
from ..... (Metal) of ..... (Thickness)
We are ☐ (are not ☐) now using inert gas-shielded welding

Name.....Position.....

Company.....

City.....State.....

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Complete facilities for the manufacture of electrical and mechanical carbons and graphite/metallic compounding—over half a century of carbon experience—extensive on-hand stocks of standard replacement brushes for "return-mail" maintenance service . . . three of the many reasons why BBB is a *good* source for your carbon needs.

BECKER BROTHERS CARBON CO.
3450 S. 52nd Ave. • CICERO 50, ILL.

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TUF-COTE

TRADE MARK

OPTICALLY PERFECT • CRYSTAL CLEAR

Make your safety lenses last 7 to 15 times longer

Save your lenses with TUF-COTE, the only true lens protection against weld spatter and grinding wheel pitting. Convince yourself, just send for a free sample TUF-COTE treated lens – give it the works in your own shop, and you will insist on having us treat all the glass safety lenses of your spectacles, goggles and helmets with TUF-COTE.

We grind and treat prescription lenses too. **TUF-COTE will leave them optically perfect, even clearer than before. For replacements order Wallace Eyeguard prescription glasses, TUF-COTE treated.**

List of representatives sent on request.

WALLACE OPTICAL COMPANY • INC
12332 E. Jefferson Avenue, Detroit 14, Michigan

Milwaukee Firms Aid Vocational Test Work

HARNISCHFEGER Corp.; the A. O. Smith Corp.; the Ladish Co.; Falk Corp.; Allis-Chalmers Mfg. Co.; Cutler-Hammer, Inc.; the Chain Belt Co.; the Koehring Co. and the Perfex Corp., all of the Milwaukee area, aided recently in developing tests for positive identification of engineering ability. The relation between the tests and the characteristics of a successful engineer were presented at the 17th Annual Convention of the Engineers' Council for Professional Development in Chicago. The studies were made by E. C. Koerper of A. O. Smith, with the cooperation of the Engineers' Society of Milwaukee and the University of Wisconsin's Bureau of Industrial Psychology.

• • •

Compressed Gas Association To Meet in New York

THE 37th Annual Meeting of the Compressed Gas Association will be held at the Waldorf-Astoria Hotel, New York City, Monday and Tuesday, January 23-24, 1950. The hotel has allotted 60 double rooms, 35 single rooms and 15 suites for the use of members planning to attend the meeting. The association office will accept sleeping room requests in the order in which they are received as long as they are available.

• • •

Sawyer Asks Cooperation Of Management, Labor

A PROPOSAL that management and labor jointly undertake a cooperative program for the strengthening and maintaining of our free enterprise system was made in a Nov. 3 address by Secretary of Commerce Charles Sawyer before the National Management Engineering Clinic in Chicago.

As a feature of the modern type of industrial management, it is necessary to make employees cost-conscious, Mr. Sawyer said. When the worker knows that the company's success and the progress of the economy depend on high and increasing productivity, he will find ways to do his job better, cheaper and quicker.

• • •

Jet Engine Bibliography Available from Government

A COMPLETE 49-page bibliography of books and published reports on gas turbines, jet propulsion and rocket power plants has been published by the Bureau of Standards. It includes sections on turbo-jet and prop-jet engines, pulse jets, ram jets, rockets, jet-propelled helicopter roters, compressors, turbines, combustion and combustion chambers, aerodynamics, metallurgy, etc.

Welding, machining and ceramics problems occupy separate sections.

Copies may be obtained by writing for circular 482, *Bibliography of Books and Published Reports on Gas Turbines, Jet Propulsion and Rocket Power Plants*, by Ernest F. Fiock, from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Cost is 20 cents.

37th Safety Show Draws Good Crowds

DESPITE the steel and coal strikes, attendance at the 37th National Safety Congress and Exposition was off very little from the record 1948 show. The 1949 exposition closed its doors Oct. 28 with a total registration of around 12,000 for the five-day period. During the big week, 261 separate safety sessions were staged at the Stevens, Congress, Blackstone, Morrison, Palmer House and Sherman hotels in Chicago. About 615 Safety authorities participated in the various programs.

The Exposition, held at the Stevens hotel, had a total of 175 exhibitors, of whom 155 were industrial concerns. Prominent among the items displayed were welding goggles, helmets, face shields, leather clothing, gloves, and fume respirators. New goggles were confined to the plastic "cover-all" type of goggle which fits over prescription glasses.

Various manufacturers of welding safety equipment included American Optical Co.; Ampco Metal, Inc.; E. D. Bullard Co.; Chicago Eye Shield Co.; Dockson Corp.; Mine Safety Appliances Co.; Sellstrom Mfg. Co.; Wallace Optical Co., Inc., Willson Products, Inc., and Ansul Chemical Co.

* * *

Cold-Welding Rights Acquired by Koldweld Corp.

KOLDWELD CORP., a newly organized company, has acquired American rights to the cold-welding aluminum process developed by General Electric Co., Ltd., in England. The company is headed by William Dubilier, of Cornell-Dubilier Electric Corp., 10 East 40th St., New York.

To provide for the widest use of the process, Mr. Dubilier said, manufacturers will be licensed under a schedule of maximum fixed fees based on the value of products or parts produced by means of this method. Koldweld Corp. will do no manufacturing but will only license others to use the tool designs.

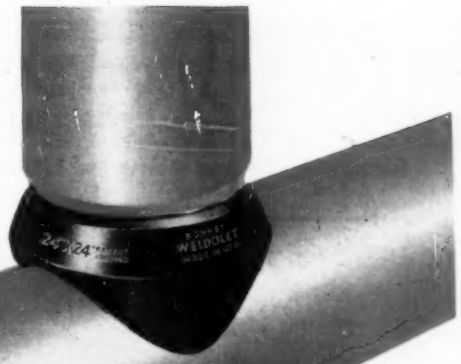
The process has been under development for some time in England (See THE WELDING ENGINEER, January, 1949) and can be used to join many metals. However, aluminum and copper have proved the most readily weldable.

* * *

Steel Mills Located in Thirty States

INSTEAD of being concentrated in a few areas, plants making or finishing steel are now scattered over 30 states, the American Iron and Steel Institute reports. There are more than 400 such plants in 250 communities.

The newest states producing raw steel are Oregon, Tennessee and Utah. Florida and Iowa have now acquired finishing capacity, with wire mills in each state. California has become one of the first ten producing states and is first in reinforcing bar capacity. Utah is fourth place in plate capacity, being exceeded only by Pennsylvania, Indiana and Illinois. Wisconsin is second largest producer of electric-welded pipe and tubing. Raw steel capacity of Texas has increased in ten years from 4,325 to 582,320 tons per year.



WeldOlets, Butt Welding — Available as standard, with outlet sizes from ⅛" to 24", both straight and reducing for use with Schedule 40 pipe up to 12" outlet. Outlet sizes 12" - 24" for standard weight pipe (⅜" wall). Also available for Schedule 80 services through 8" outlet and extra strong through 24" outlet size (for use with pipe having ½" wall).

You write

SPEED, ECONOMY AND FULL PIPE STRENGTH

***into the job when you specify* WELDOLETS**

With WeldOlet branch pipe welding fittings you provide the quickest, most economical, most satisfactory method of obtaining full pipe strength at branch connections.

Note in the above illustration how the WeldOlet tapers to provide a single bevel groove joint at the crotch section and blends into a V-butt joint at the ear portion.

WeldOlets need no additional reinforcement to establish and fully maintain original strength on ASTM A-106 Seamless Steel Grade A Pipe, as set forth in Code for Pressure Piping, American Standards Association, B31.1-1942, and Supp. No. 2, B31.1-b-1947.

To meet special conditions, these fittings can be furnished in any forgeable metal including wrought iron, toncan iron, nickel, Monel, Everdur, stainless grades 304, 316, 347, etc.

For detailed engineering reference data, write for Catalog W-2.

BONNEY FORGE & TOOL WORKS

Forged Fittings Division, 354 Green Street, Allentown, Pa.

Authorized Canadian Factory Representative:

Sterling Steel Co., Ltd., 20 Temperance Street
Toronto 1, Canada

WELDOLETS

FOR WELDED BRANCH PIPE OUTLETS

WeldOlets, Socket Welding — Available as standard, with outlet sizes ⅛" - 10", both straight and reducing, for use with Schedule 40 pipe. Also available in Schedules 80 and 160 up through 4" outlet size.

ThredOlets — Available as standard, with outlet sizes ⅛" - 10", both straight and reducing, for use with Schedule 40 pipe. Also available in Schedule 80 up through 2" outlet size.

Fig. 1 — Cut-away view of reducing size WeldOlet with welding outlet in place. The external rib and wide bases or footings of WeldOlets eliminate the need for extra supports to take care of bending or vibrational stresses at crotch section, the point of greatest stress.

Fig. 2 — Note blending of ear portion of welding fitting to run pipe. Extension of weld metal below inside scarfed portion of pipe insures all sections of joint greater than pipe wall thickness.

new! DELTA® "Dual Weld" COMBINATION WELDER

Combines 5KVA spot welder and 120-ampere arc welder!

You can do these 4 jobs with this one money-saving combination:

1. Spot weld
2. Arc weld
3. Braze
4. Solder

Spot weld fine wire as efficiently as 16-gauge steel, without burning or overheating—on a production basis. Do all light-duty production spot welding and intermittent arc welding faster and more uniformly. Change from one operation to another in a hurry.

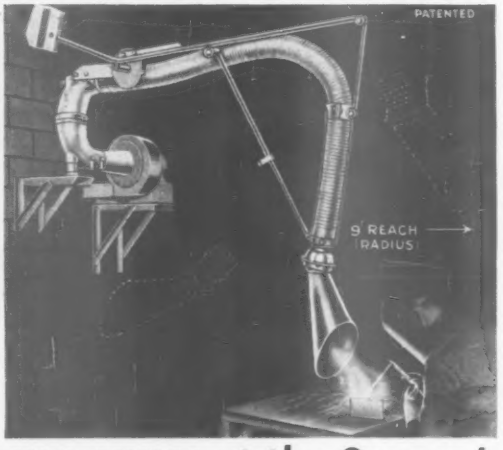
You can—with this Delta Combination Welder. It saves you money, too. It costs much less than an individual 5KVA spot welder and 120-ampere arc welder.

There's no other welder like it! Delta upholds its reputation for top quality, with exclusive features that assure low maintenance and operating costs.

Have your nearby Delta distributor show you this new Delta Combination Welder. Also see the new Delta 5 KVA Spot Welder and the Delta 120-Ampere Portable Arc Welder. And ask about buying on easy time payments. *Send for free Bulletin AD-453.*

POWER TOOL DIVISION
Rockwell MANUFACTURING COMPANY
MILWAUKEE 1, WISCONSIN

RUEMELIN Fume Collector



(Above) Welding without ventilating snout. Note smoke clouds and poor vision. Gases and heat surround operator's helmet.

(Right) Collecting fumes with a Ruemelin Fume Collector.

REMOVES WELDING FUMES *at the Source!*

Solve your welding fume problem efficiently by installing Ruemelin Welding Fume Collectors. They produce a powerful suction that removes smoke, gas and heat at the source. Guards employee health, resulting in less welder fatigue. Clears shop air with minimum heat loss. Covers maximum welding area vertically, horizontally and by circle swing. Made in 9 ft. and 15 ft. reach sizes. Shipped assembled, easy to install. Thousands in practical service. Free engineering service for your installation.

Write for our New Bulletin 37-D and list of users — just off the press.

RUEMELIN MFG. CO.

MANUFACTURERS AND ENGINEERS
SAND BLAST AND DUST COLLECTING EQUIPMENT
3880 NORTH PALMER STREET • MILWAUKEE 12, WISCONSIN, U. S. A.

European Industry to Rival American Production Efforts

A STRONG threat to American industry has been hastened by the recent devaluation of the British pound, according to James F. Lincoln, president of the Lincoln Electric Co., Cleveland. However, several factors have so far prevented a flood of European goods on our markets, in Mr. Lincoln's opinion. One is that the European factories are still enjoying a sellers' market; another is that their production methods have not reached a stage of efficiency to compare with America's.

* * *

Lincoln Award Program Explained in Booklet

RULES and conditions for the 1949-50 Lincoln Engineering Undergraduate Award and Scholarship Program are printed in an illustrated 24-page booklet now available from the James F. Lincoln Arc Welding Foundation, Cleveland 1.

Information about previous award programs is also included in the booklet as well as suggested subject matter for student papers and a welding bibliography. Some 37 pictures taken from previous award papers show some of the ideas on welding and its application for which awards have been received.

* * *

300-Ton Welded Trailer Moves Oil-Drilling Rigs

FOR moving rotary oil-drilling rigs and draw-works without disassembling, a 300-ton capacity trailer has been built by Eidal Mfg. Co., Albuquerque, N. M. Arc welding was the main fabrication method for the framework and axle mountings. Electrodes used were E-6010 and E-6012 type.

Original method of moving rigs required 30 days but with this 72,000-lb trailer the equipment can be moved in 24 hours at about 1/6 the cost.

* * *

NEW LOCATION of Lampton Welding Supply Co., Wichita, Kansas. Building was opened with two-day open house celebration

Lampton Welding Supply Holds Open House

LAMPTON Welding Supply Co., 150 South Washington, Wichita, Kans., held a two-day open house and welding clinic on October 14-15. Demonstrations of electrodes, arc welders, submerged-melt welding, inert-arc welding and flame cutting were staged morning, afternoon and evening. Door prizes and refreshments were added attractions.

New ASME Code Allows Lighter Pressure Vessels

THE 1950 edition of Section Eight of the ASME Boiler Code embodies all the changes in the code for unfired pressure vessels that have taken place since 1946. It covers carbon and low-alloy steels only. Rules for non-ferrous, cast iron and high alloy steels are now in preparation and will be added to the present volume.

Lighter vessels may be constructed with more flexibility of manufacture under the new code since the stress tables are based on a safety factor of four instead of the five in the 1946 code.

Copies are available at $3.50 each from the American Society of Mechanical Engineers, 29 West 39th St., New York 18.

* * *

W. H. Morris Joins Son in Welding Business

W. H. MORRIS, employed with the Linde Air Products Co. for the past 23 years, has resigned to enter into business with his son, W. E. Morris, Toledo, O. The younger Morris is a Linde distributor through Welders Needs, Inc., Toledo.

Mr. Morris, Sr., became interested in welding during the first World War when he worked for Great Lakes Engineering Co. at Detroit. In 1917 Mr. Morris introduced oxyacetylene welding and cutting practices into operations at the Collingwood Shipbuilding Co., Collingwood, Ont. He joined Linde in 1923 as a service operator and oxyacetylene welding instructor. For the last 10 years Mr. Morris handled Linde jobbing lines, industrial and automotive, in Michigan and the Northern part of Ohio.

Welders Needs, Inc., has trucks which cover a radius of 60 miles from Toledo.

* * *

"Marform" Process Shapes Metals Efficiently

FORMED sheet metal parts now can be produced at savings as high as 50% with the "Marform" process, recently announced by engineers of the Glenn L. Martin Co., Baltimore. An example cited is an estimated rate of production of 50 stainless steel exhaust stacks per hour as compared to the drop hammer rate of 3 or 4 per hour. Sheet metal parts can be made to a tolerance of 0.002 in., it is claimed, with accuracy at least equivalent to that obtained with steel dies. Elimination of finish forming of parts by hand as now required on parts formed with rubber in the hydro-press is said to be another advantage of the new process.

* * *

Plastic and Glass Curtain Used for Welding Booth

VINYL-COATED cloth woven of Fiberglas yarns is used for the four sides of a new welding booth in the main plant of Tube Turns, Inc., Louisville, Ky.

The new cloth is noncombustible and has high tear strength. It is also said to be moisture proof, mildew resistant, colorfast and durable. In addition, it is resistant to most acids and alkalies. Material is made by The Holton Corp., New Orleans, La.

PREFERRED!

FOR SILVER BRAZING OF

APW SILVALOY 15

THE SILVER PHOSPHORUS COPPER ALLOY

WHY?

- IT IS EXTRUDED IN ROUND FORM.
- IT HAS SHORTER GRAIN.
- IT HAS NO JAGGED EDGES, THEREFORE EASIER HANDLING.
- IT SPEEDS UP PRODUCTION.

Silvaloy 15 has become the preferred alloy for brazing copper, brass or bronze, either to themselves or to each other. Melting at 1185°F and flowing at 1280°F, Silvaloy 15 makes high-strength joints which have as good electrical conductivity as the joined metals and, furthermore, are leak-proof and highly corrosion resistant.

On copper, the phosphorus in Silvaloy 15 acts as a fluxing agent, so that no flux is needed. On brass and bronze, small amounts of APW flux are recommended for perfect results, although this is not always necessary. Use Silvaloy 15 for brazing copper refrigeration coils, copper electrical parts, water heaters, copper, brass and bronze tubing and pipe and innumerable other applications involving copper and copper alloys. Silvaloy 15 is supplied in extruded round wire rod, sheet, strip, wire coils, rings and special shapes.

OTHER ALLOYS MANUFACTURED BY THE AMERICAN PLATINUM WORKS

ALLOY NO.	SILVER CONTENT	MELTING POINT	FLOW POINT
SILVALOY 20	20%	1430° F	1500° F
SILVALOY 35	35%	1125° F	1295° F
SILVALOY 40	40%	1135° F	1205° F
SILVALOY 45	45%	1125° F	1145° F
SILVALOY 50	50%	1160° F	1175° F
APW 250	40%	1222° F	1416° F
APW 355	58%	1152° F	1203° F

APW No. 1100 Low Temperature Flux and APW No. 1200 Universal Flux recommended for use with these alloys.

THE AMERICAN PLATINUM WORKS

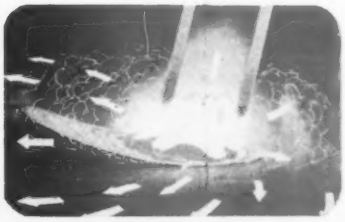
231 NEW JERSEY R. R. AVENUE NEWARK 5, N. J.

CHICAGO SALES OFFICE: 55 E. WASHINGTON STREET

DETROIT SALES OFFICE: 5151 WESSON AVENUE

How can you cut costs with ARC WELDING?

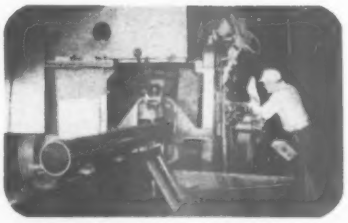
See this film and find out!



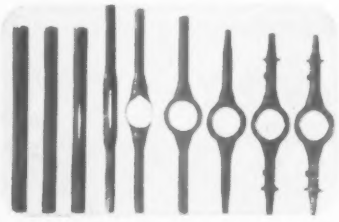
1. "ARC WELDING AT WORK", a 16mm full-color motion picture produced by General Electric, has a message for every cost-conscious executive who may be overlooking opportunities for arc welding in his own plant. A vivid animated treatment (above)...

2...makes the technical parts of this film highly palatable. New uses for arc welding are suggested throughout. Welded building construction, for example (above) is shown to be efficient and economical. And as outdoor pressure vessels and piping . . .

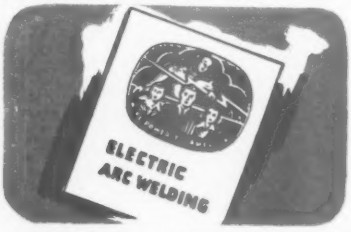
3...become larger and more complicated the value of modern arc welding becomes more and more evident. In fabricating a consumer product like kitchen sinks (above), the film shows how high-quality welding adds extra eye appeal and salability.



4. As exemplified in this tubing machine (above) automatic arc welding is shown to offer almost limitless opportunities. Here, precise heat control is the big factor. Also, arc welding provides highly ductile joints, a fabricating requirement for . . .



5...this automotive rear-axle housing (above). These welded joints withstand ten severe stretching and swaging operations, with no sign of failure! Because we believe you can profit from a wider knowledge of arc welding, let us send you this . . .



6. ARC WELDING MANUAL . . . FREE! It has all the data you need to make an intelligent decision on this vital subject. [The complete program consists of a 30-minute film, manual and "highlights" booklets.] MAIL THE COUPON TODAY!

FREE *to business management!*

General Electric Co., Section G684-13
Schenectady 5, N. Y.

Attach to your business letterhead

☐ Please send me a complimentary copy of the G-E Arc Welding Manual (GES-3491). (Extra copies at regular manual price—$1.25.)

☐ I'd like to borrow a 16mm print of the color film from my nearest G-E office.

Name _____ Title _____

Company _____

Street _____

City _____ State _____

GENERAL ELECTRIC

Pound Devaluation Closes Philips New York Plant

NORTH AMERICAN PHILIPS CO., INC., New York City, has closed its plant at Dobbs Ferry, N. Y., and is moving production facilities to other plants. The move was made because of the devaluation of the British pound.

Since the devaluation, imported "contact welding" electrodes can be bought at savings of as high as 50% over original prices.

* * *

Larkin Lectro Products Moves to Pine Bluff, Ark.

ALL facilities of the Larkin Lectro Products Corp., formerly of New York City, are being moved to a larger plant at Pine Bluff, Ark. The firm will manufacture arc and resistance welding equipment as well as power and distribution transformers. Deliveries from the new location were scheduled to begin December 1.

* * *

High Voltage Welds Autos to Fence

A LINE of automobiles was welded to a steel fence in a freak accident at East Pasadena, Calif. A portable crane knocked a high-voltage line across the fence, and the current arced across to the bumpers of the cars, welding them to the fence.

* * *

Metal Cleaner Firm Moves to Larger Plant

FIDELITY CHEMICAL PRODUCTS CORP., manufacturers of industrial metal treating and cleaning compounds for all purposes, has moved to larger quarters at 470 Frelinghuysen Ave., Newark, N. J. The building houses research, testing and production facilities.

* * *

CAPPING a 12-year growth, Birdsell Mfg. Co. recently moved into this new factory building

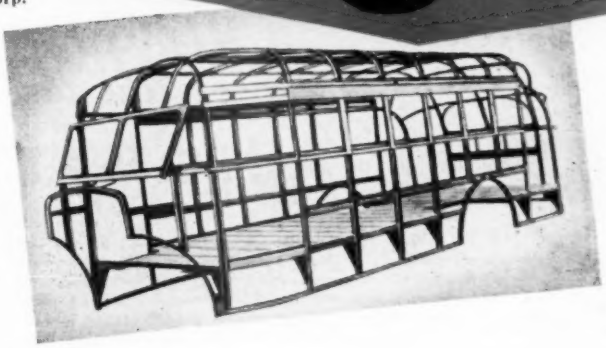
Birdsell Mfg. Moves To New Factory

CONSTRUCTION on its new factory at Mountain View, Calif., was recently completed by the Birdsell Mfg. Co. Moving into the new building climaxes a 12-year development of Birdsell, which manufactures arc welders, spot welders, carbon-arc torches, seam welders, battery chargers and slag hammers.

Officers of the company are Harold J. Birdsell, president, and chief engineer; Charles Weston, general manager and controller and Robert B. Young, general sales manager. Superintendent of production is R. W. Frisbie.

FRAMED and COVERED with safety

Pictures courtesy of Oneida Products Corp.



The greater strength and toughness of N-A-X HIGH-TENSILE steel permits weight savings of up to 25% in section—and still affords maximum protection against injuries from traffic accidents.

Its superior fatigue-resistance and excellent weldability prolongs this safety-factor . . . reduces maintenance costs over more miles and under all conditions.

If you manufacture a product requiring high strength, toughness and good weldability, it will pay you to investigate N-A-X HIGH-TENSILE.

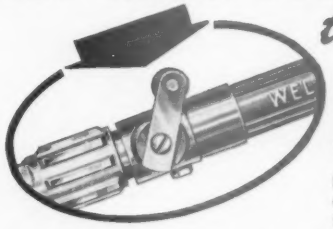
MAKE A TON OF SHEET STEEL GO FARTHER
Specify—
N-A-X
HIGH-TENSILE STEEL

GREAT LAKES STEEL CORPORATION
N-A-X Alloy Division • Detroit 18, Michigan
UNIT OF NATIONAL STEEL CORPORATION

National
Carbide
EFFICIENT
ECONOMICAL
DEPENDABLE
for
Welding & Cutting
SPECIFY
NATIONAL CARBIDE IN THE RED DRUM
Write us for information as
to nearest available stock.

NATIONAL CARBIDE CORPORATION
60 E. 42nd St., New York 17, N. Y.

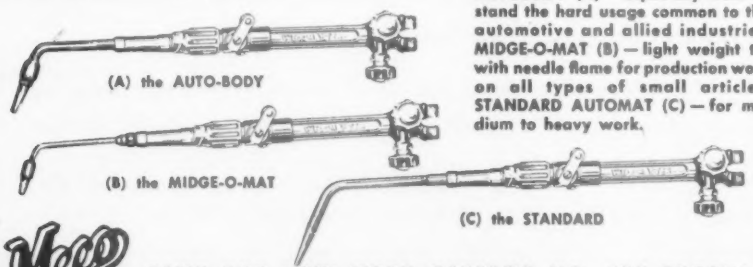
for Mass Production Welding
there's no torch like the
Meco AUTOMAT



The famous MECO "On-Off" Action (above) allows a tiny pilot light to burn at the tip with the action in the "off" position. At a touch it flashes to full production flame. Action tested over 200,000 times without appreciable sign of wear.

For mass production there is no such thing as a good all-round torch. Time and motion studies have proved that for efficient production welding, the torch used must be fitted to its particular job. The Meco AUTOMAT family — embodying the famous MECO "On-Off" action (oval), is perfectly suited to the start and stop welding so common to production. The importance of this time saving feature to mass production work is apparent. Beyond this, each member of this family has built-in features perfectly suiting it to its own particular class of welding.

AUTOBODY (A) — especially built to stand the hard usage common to the automotive and allied industries. MIDGE-O-MAT (B) — light weight tip with needle flame for production work on all types of small articles. STANDARD AUTOMAT (C) — for medium to heavy work.



Meco
SEND FOR NEW MECO CATALOG NO. 130 TODAY!
Modern Engineering CO., Inc.
3411 PINE BLVD. ST. LOUIS 3, MO.

About People

ROBERT W. WOLCOTT, president of Lukens Steel Co., Coatesville, Pa., since 1925, was named chairman of the board in a recent meeting of the board of directors. CHARLES LUKENS HUSTON, JR., vice-president and executive assistant to the president since February, 1948, was elected president at the same time.

* * *

A. T. WAIDELICH has been named vice-president in charge of research for the Austin Co., Cleveland. Mr. Waidelich is credited with major responsibility for development of the H-section welded truss. He is a member of the American Welding Society, American Society of Civil Engineers, the American Concrete Institute, the National Society of Professional Engineers, Tau Beta Pi and practices as a professional engineer in nine states.

* * *

J. H. GOODSPEED, formerly in the Chicago sales office of Titan Metal Mfg. Co., Bellefonte, Pa., has been placed in charge of the company's St. Louis sales office at 817 Arcade Bldg., St. Louis. Mr. Goodspeed will be assisted by MISS L. A. ORBACH in the St. Louis area. She was formerly a partner in the Clark-Wells Metal Co.

* * *

ROBERT A. SPECK and GEORGE R. MILNE have been appointed vice-presidents of National Carbide Corp., New York City. Mr. Speck will handle sales and distribution and Mr. Milne will be in charge of operations. RUSSELL T. LUND has been appointed operating manager in charge of practice, procedure and methods at all company plants. Other appointments announced were those of ASTOR BROWN who becomes acting works manager at Ivanhoe, Va., and CLARENCE G. BURNHAM who becomes controller. GEORGE R. FULLER continues as general sales manager reporting to Mr. Speck. W. P. METCALF has been appointed purchasing agent. R. J. NIEBANCK becomes technical assistant to the president.

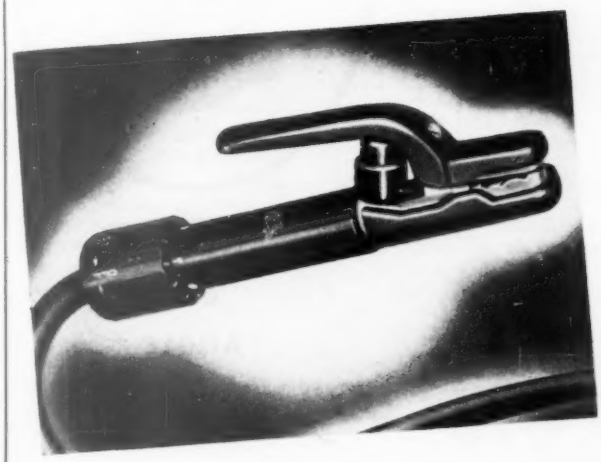
* * *

W. C. CHAPMAN has been named senior field superintendent of the Freyn Engineering Co., a subsidiary of Koppers Co., Inc. ROBERT K. MATTHEWS has been advanced to the post of general construction superintendent. RUSSELL A. POWELL has been appointed assistant chief engineer.

* * *

DR. NICOL H. SMITH has been appointed director of research operations at the Franklin Institute Laboratories for Research and Development, Philadelphia. Other appointments are: RALPH H. MCCLARREN and FRANK S. CHAPLIN as associate directors; HARRY H. STOUT, JR., assistant director for contract administration and PETER F. SUFFREDINI, manager of administrative services.

At Long Last . . . COMPLETE REMOTE CONTROL FOR DC ARC WELDING MACHINES!



← Standard make holder equipped with special grip from which machine is controlled.

Remote control for DC ARC welders in operation at plant of large soap manufacturer in Cincinnati.

↓

The Revolutionary New Time and Work Saver that Transfers *All* Machine Controls to the ELECTRODE HOLDER!

This remote control enables the welder to start and stop the machine, select straight or reverse polarity, and exercise smooth stepless control of the heat range *RIGHT AT THE ELECTRODE HOLDER!*

EASY TO INSTALL! Complete instructions are furnished, and the average electrician or maintenance man can install the device in less than an hour!

FREE LITERATURE AVAILABLE!

Please send me the Free Literature available on the Remote Control for DC ARC Welding.

COMPANY NAME .....

ADDRESS .....

YOUR NAME .....

POSITION .....

FOSTER TRANSFORMER COMPANY

3820 COLERAIN AVENUE, CINCINNATI 23, OHIO **MULberry 2420**

13% MORE WELDS PER INCH OF ROD WITH

SPEER

CARBON ELECTRODES

Uniform composition of Speer Carbon Electrodes provides even, steady burning, with maximum heat and penetration at welding point. High current carrying capacity plus exceptional stability, means less spluttering and spindling waste... 13% more welds per inch of rod.

This smooth burning develops a better point, as well, concentrating the arc for hotter, more uniform welds.

4 ELECTRODE GRADES AVAILABLE IN STANDARD SIZES

For D.C. Welding

Speer Carbon Rods—Standard grade, hard and strong to last long when current density requirements are normal.

Speer Hold-Ark Rods—Softer than carbon rods and with higher carrying capacity. Offer high resistance to sudden impact and strain.

Speer Special Graphite Rods—Highly graphitized for use with high amperages and temperatures. Give longer life than other grades for continuous severe service on large work.

For A.C. Welding

Speer ACWeld Electrodes—Plain, or copper-coated for better carrying capacity and burning qualities when current is high.

And be sure of best results, use Speer Welding Plates, readily cut or shaped to any desired shape or form, and Speer Welding Paste, a superior fire-resistant paste, easy to mold.

Write for bulletin listing available Speer Electrode sizes.

5021

Speer

CARBON COMPANY
ST. MARYS, PENNA.

EUGENE C. O'CONNELL, formerly service engineer at the Los Angeles branch of Independent Pneumatic Tool Co., Aurora, Ill., has been named manager of the San Francisco office. CLARENCE H. GABRIEL, formerly service engineer in the Salt Lake City branch, is the new manager at Denver.

* * *

H. R. SALISBURY has been appointed president of Air Reduction Sales Co. Mr. Salisbury has been with the organization 23 years. Vice-presidents appointed were H. F. HENRIQUES (general sales); J. J. LINCOLN, JR., (railroad sales and sales services); S. B. STOUFFER (distribution); N. L. WISSER (field office management). Other officers of Air Reduction Sales Co. are: C. G. ANDREWS, vice-president in charge of operations; J. D. GUNTHER, secretary; W. W. WINTERS, treasurer, and J. E. SLATER, controller.

* * *

THOMAS M. CUNNINGHAM has been appointed to the staff of Heating, Piping and Air Conditioning Contractors' Chicago Association. Mr. Cunningham is coming to Chicago from Syracuse, N. Y., where he was director of industrial relations for Carrier Corp.

* * *

KENNETH A. FIELD has been named service manager of the Wellsville, N. Y., works of Worthington Pump and Machinery Corp.

* * *

ELWOOD E. ZERBE has been appointed field engineer in the Atlanta district for the Nelson Stud Welding Division of Morton-Gregory Corp.

* * *

LAURENCE S. DAHL has been elected operating vice-president of Columbia Steel Co., San Francisco. O. L. PRINGLE has been elected sales vice-president of the company, which is a subsidiary of U. S. Steel Corp.

* * *

J. R. CONNELL has been named assistant purchasing agent of The Babcock & Wilcox Tube Co. Since 1942, he has been in charge of the purchasing-department of the company's Welded Tube Division at Alliance, O.

* * *

C. K. BANKS has been named director of research of the Metal & Thermit Corp., New York City. His headquarters will be at the company laboratory at Woodbridge, N. J.

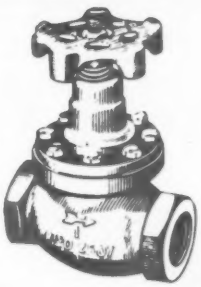
* * *

E. J. DE RIDDER, has recently become a member of Reynolds Metals Company's staff of technical service engineers. Mr. de Ridder will do aluminum design work, on which he is a recognized authority. He was chief engineer with I. G. Farben Lightmetal Division in Europe from 1926 to 1945.

* * *

MELVIN O. MONSLER has been appointed sales manager of the Welding Division, Harnischfeger Corp., Milwaukee. Mr. Monsler was formerly assistant sales manager.

REGO



GLOBE and ANGLE VALVES

Diaphragm construction provides permanent seal for valve stem, eliminating necessity for adjustment or repacking as required with ordinary packed-type valves.

Back-seating permits replacement of diaphragm while valve is under pressure.

Design Working Pressure 400 psi (oil, water or gas)

Large Passages reduce friction losses to a minimum.

Sizes
3/4"
1"
1-1/4"
1-1/2"
2"

Write for catalog

BASTIAN-BLESSING
4201 W. Peterson Ave., Chicago 30, Illinois
Pioneer and Leader in the Design and Manufacture of Precision Equipment for Using and Controlling High Pressure Gases

LAWRENCE E. DICKSON, president of the Standard Safety Equipment Co., Chicago, was elected president of the Industrial Safety Equipment Association for the second consecutive year.

* * *

Died . . .

MRS. HAZEL M. HAKALOW, 39, president of General Welding Co., Detroit, was killed Sept. 17 in the *S. S. Noronic* fire at Toronto. Mrs. Hakalow, one of the few women actively interested in welding, was the only lady member of the American Welding Society in Detroit and was also a member of the Detroit Section executive committee.

* * *

ARTHUR OBERNDORFER, advertising manager of Hevi-Duty Electric Co., Milwaukee, suffered a heart attack and died recently while on a business trip to Cleveland.

* * *

DOUGLAS B. HOBBS, in charge of motion pictures, educational and technical information activities of the public relations and advertising department of Aluminum Company of America, died Oct. 11. He was 49.

30 YEARS AGO

(From THE WELDING ENGINEER of December, 1919)

CUTTING of rivets and removing them by electric arc process has been announced by a French concern. Success of the process is due to a coating used on the electrode which consists of a combination of oxidizing agents, borax, silicates and carbon. Heretofore, American attempts at cutting rivets with the bare electrode have not been successful because of the formation of heat-resistant oxides. With the new process, a 3-16 in. diam. electrode covered by a 1/16 in. coating on 250-300 amp can destroy the head of a 1-in. diameter counter-sunk rivet in 20 seconds.

—30 YEARS AGO—

A BAN on the welding of boilers and other pressure vessels has been adopted in at least four states, Indiana being the most recent. The editor of THE WELDING ENGINEER believes that concerted action by a welding society should be undertaken to defeat such arbitrary rulings. It is true that some weldors are not competent to work on pressure vessels, but others can consistently do so using good equipment under precise conditions.

—30 YEARS AGO—

SUICIDE BRIDGE, a famous landmark over a lagoon in Lincoln Park, Chicago, has been dismantled with the aid of the oxyacetylene torch.

— 30 YEARS AGO —

BRAZING of broken teeth in the big saws in lumber mills has proved successful, writes a correspondent in reply to a recent letter in THE WELDING ENGINEER.

Galv-Weld

REMARKABLE WAR-TIME DEVELOPMENT

Now Available!

● **Re-galvanizes sheets, shapes and pipes . . . quickly, easily, inexpensively.**

● **Assures protection against rust and corrosion.**

● **Makes a permanent bond with the base metal.**

A stick of low-melting zinc-base alloy, Galv-Weld quickly and easily re-galvanizes structures and sheets from which the galvanizing has been burned off during the welding process. Galv-Weld coatings were found by U.S. Navy Yard tests to be actually superior to the original coating.

Galv-Weld needs no flux; no sandblasting. Doesn't make fumes; won't peel or chip. Easily applied in any position, and in confined quarters. Makes riveted, soldered and bolted construction of galvanized members obsolete.

Why not see for yourself what Galv-Weld will do? Send for a trial order of 6 bars (¼" size) for $3.00. Write us now.

UNITED STATES STEEL SUPPLY COMPANY

WAREHOUSES COAST-TO-COAST
HEADQUARTERS OFFICES: 208 S. LA SALLE ST.
CHICAGO 4, ILLINOIS

UNITED STATES STEEL

An oxy-acetylene flame as seen through a Shade No. 4 METALKLAD GOGGLE LENS. Note . . . the absence of glare and the sharpness of the work.

VISUAL DEMONSTRATION

OF THE *Superiority of* AGILE *Metalklad* WELDING GOGGLE FILTER LENS

THEY DIFFUSE HARMFUL FLAME GLARE AND HAZE!

42% MORE VISIBILITY
15-50% MORE EFFICIENCY
100% EYE PROTECTION

See your welding distributor for prices and literature or write to—

An oxy-acetylene flame as seen through a Shade No. 4 ordinary goggle lens. Note . . . the amount of glare and lack of detail in comparison with photograph at top.

These filter lens are as different from ordinary lens as day is from night. The clear, sharp vision of the work, obtained through AGILE METALKLAD WELDING GOGGLE FILTER LENSES, decreases eye-strain and eye-fatigue, thereby increasing production efficiency. Available in any density and quantity.

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5806 Hough Ave., Cleveland 3, Ohio
Gentlemen: Please send us complete Agile Metalklad Filter Plate literature and prices.
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Address .....
Title .....
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AMERICAN AGILE CORPORATION

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WELDING ENGINEERS, DESIGNERS, SUPERVISORS!

HERE'S A BOOK TO HELP YOU...

"WELDING DESIGN HANDBOOK"

7 chapters containing complete data for those engaged in welding design. In addition to consideration of basic design problems, there is included a number of single pages of data. These are grouped to give pertinent data on welding processes, weld joints and stresses, welded design, cost, materials, pipe data and engineering tables.

• •

$1.50 per copy

• • •

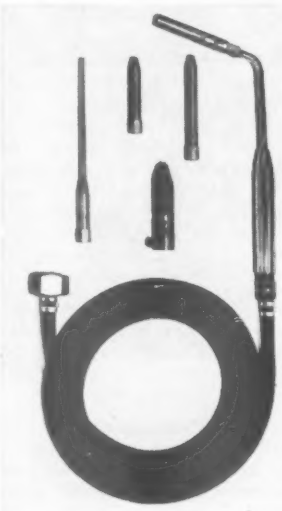
Order Today, from

THE WELDING ENGINEER

330 W. 42nd St. **New York 18, New York**

NEW PRODUCTS

(Continued from page 46)



FOUR TIPS come with air-acetylene outfit for repairing radiators, copper installations

Air-Acetylene Outfit

FOR small soldering, low-temperature brazing, heating and lead burning, the Airco No. 75 air-acetylene outfit consists of four tips, a torch, five feet of 3/16-in. hose, a soldering iron and soldering copper.

The four tips include: radiator soldering tip: No. 9 tip for medium flames; No. 10 tip for pointed concentrated flames and No. 15 tip for brush-type flame for heating broad areas.

Applications are expected in the auto repair business, for electrical connections and for copper installations.

AIR REDUCTION SALES CO., 60 East 42nd St., New York City 17.

* * *

Metal Cutting Saw

ONE-PIECE welded construction on the cutting head of the new Wells Model M. metal cutting saw assures alignment and total blade enclosure. Capacity of the saw is 9 by 18 in. with maximum clearance under the saw blade of 20 in.

Hydraulic control raises and lowers the machine. Special valves on the hydraulic system keep the oil at a selected pressure on the blade for longer blade life. A stock stop automatically moves out and up at completion of cut to eliminate binding of stock on blade.

* * *

Ribbon Solder

FINE copper wires may be joined with a match flame by using a new low-melting-point ribbon solder coated with a non-corrosive rosin flux. A small length, about ¼ in., of the ⅜-in. wide ribbon is wrapped around the wire joint, which is then heated with the match or a cigarette lighter until the metal flows into the splice.

PROVED PRODUCTS MFG. CO., Drawer 1190, San Fernando, Calif.

GET 2 to 25 TIMES LONGER LIFE

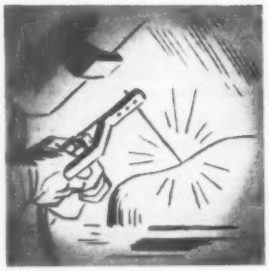
with one of these 9 HAYNES hard-facing alloys

Protect metal parts from wear the economical way—by hard-facing them with a HAYNES alloy. These brief descriptions will help you select the right one for your wear problem.

HAYNES hard-facing alloys are easy to apply by all welding methods:

OXY-ACETYLENE

Smooth sound deposits can be made by both manual and automatic methods with HAYNES bare rods.



METALLIC ARC

Flux-coated rods, available in practically all grades, provide a steady, quiet arc

"HELIARC" WELDING

This new process provides another fast method for depositing HAYNES bare rods.

HAYNES STELLITE Cobalt-Base Alloys

HAYNES STELLITE Alloy Grade 1: The hardest of the cobalt-base alloys recommended for coating surfaces subjected to extreme abrasive wear and slight impact. It is especially useful for resisting heat or corrosion combined with abrasion.

HAYNES STELLITE Alloy Grade 6: The toughest and strongest of the cobalt-base alloys. Recommended for coating surfaces subjected to mechanical or thermal shock. Produces sound deposits that will not check or crack.

HAYNES STELLITE Alloy Grade 12: A hard, wear-resistant alloy that is tough enough to withstand shock and impact. Recommended for coating large areas where deposits free from checks or cracks are required.

HAYNES Iron-Base Alloys

HAYNES Alloy 90: Highly wear-resistant. Resists oxidation and retains much of its original hardness at temperatures up to 1,000 deg. F. Withstands moderate impact.

HAYNES Alloy 92: A moderately low melting point rod. Use it on thin sections where low-temperature deposition is necessary to prevent distortion and on large parts when preheating is difficult or impossible. Deposits have a hardness of Rockwell C 65.

HAYNES Alloy 93: Gives excellent service where high cold-hardness is necessary. It is suitable for applications involving abrasion from sand, gravel, mill scale, or other hard particles.

HASCROME Rod: A work-hardening rod, recommended for use under conditions of severe impact. It is widely used for hard-facing rock and earth handling equipment parts. Recommended for electric application to manganese steel.

HAYNES Tungsten-Base Alloys

HAYSTELLITE Cast Tungsten Carbide: The hardest of all HAYNES hard-facing alloys, used where utmost resistance to abrasion is required. Typical applications include oil-well drilling tools, ditcher teeth, and coal undercutter bits.

HAYNES Nickel-Base Alloys

HASTELLOY Alloy C: Recommended for building up wearing surfaces of hot-working steel mill parts such as hot shear blades, entry guides, and shafts.

HAYNES alloys
TRADE-MARK

The trade-marks, "Haynes," "Haynes Stellite," "Hascrome," "Haystellite," "Hastelloy," and "Heliarc" distinguish products of Union Carbide and Carbon Corporation and its Units.

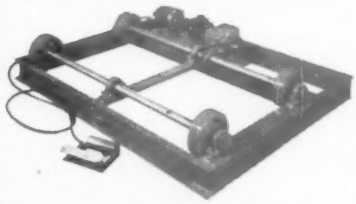
Haynes Stellite Company
Unit of Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
Sales Offices
Chicago — Cleveland — Detroit — Houston
Los Angeles — New York — San Francisco — Tulsa

TURNING TANKS IS OUR BUSINESS!

YOU'LL WELD 'EM AT LESS COST IF YOU USE

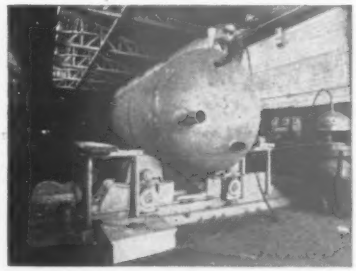
REED *ENGINEERED TURNING ROLLS*

THE ONLY COMPLETE LINE OF MODERN TANK WELDING EQUIPMENT



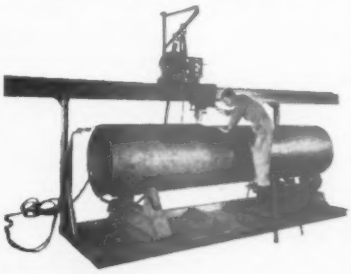
★ **THE NEW RD-20 TURNING ROLL**

Cap. 2,000 lbs.—handles up to 6 ft. x 12 ft. tanks. Priced at $650.00 F.O.B. Factory. Described in Bulletin No. 70.



★ **HEAVY DUTY TURNING ROLLS**

Built in 5 standard sizes—3 ton, 6 ton, 12½ ton, 25 ton and 50 ton. Complete details shown in Bulletin No. 68.



★ **UNIT TYPE FOR AUTOMATIC WELDING**

Combines Turning Rolls and Track Support into one compact unit. Made in 5 standard sizes— Special units made to order.

★ **POWER DRIVEN PIPE ROLLS**

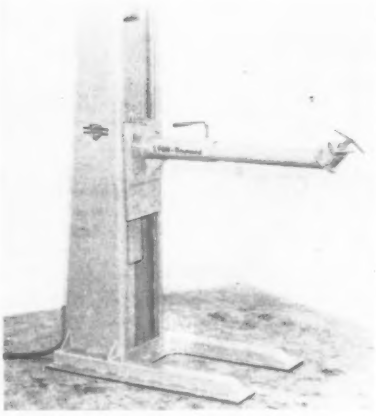
For accurate fit-up, assembly and welding. Both standard and special units built to your requirements.

We Build a Complete Line of Tank Welding Equipment, Including Bending Rolls, Assembly Presses, Horn Jigs, Track Support and Welding Gantries.

COMPLETE INFORMATION MAILED AT YOUR REQUEST

REED ENGINEERING CO.

CARTHAGE, MISSOURI, U. S. A.



VARIOUS attachments may be fitted to revolving arm of a new elevating positioner

Welding Positioner

A 1,000-lb hydraulic elevating positioner is offered in several models suitable for assembly or welding operations. On the unit pictured, the adjustable revolving arm is fitted for attachments such as the Aronson balanced positioning arm, a standard platform, a low height platform and adjustable forks.

The unit may be operated by a hand pump, foot pump, electric power or an air-operated pump.

LYON-RAYMOND CORP, 9958 Madison St., Greene, N. Y.

* * *

NEW PRODUCT BRIEFS

Lifetime oil-lubricated, shaded-pole motors designed for operation in any position—shaft up, down or at an angle—can be used as drives for exhaust fans, evaporative coolers, smaller pumps, etc. Ratings range from 1/40 hp to 1/12 hp. FRACTIONAL HORSEPOWER MOTOR DIVISIONS, GENERAL ELECTRIC CO., Schenectady 5, N. Y.

* * *

New motor-generator battery charger for charging any type of industrial truck batteries is designed to charge 200 to 500 amp hour lead-acid batteries of 12, 15, 16 and 18 cell capacity, and/or 150 to 450 amp hour nickel-iron batteries of 20, 24 and 30 cell capacity. MOTOR GENERATOR CORP., Hobart Square, Troy, O.

* * *

For rolling mill applications, a new X-ray thickness gauge is designed to measure cold rolled steel to accuracies of .0001 in. Gauge compares the amount of X-ray absorption from two X-ray beams identical in intensity, one through a sample of exact thickness, the other through the steel strip being rolled. WESTINGHOUSE ELECTRIC CORP., P. O. Box 868, Pittsburgh 30.

* * *

Corrosion-resistant steels known as "Super Rustfree" are claimed to have improved chemical resistant properties as compared with stainless and high nickel-moly alloys. UNIWORLD RESEARCH CORP. OF AMERICA, 1302 Ontario St., Cleveland 13.

It's New!

Designed and patterned after Federal specifications

Here is the newest and latest addition to the comprehensive line of Sellstrom Welding Helmets.

Just consider these facts:

1. **It is one-piece construction of the same tough fiber used in all high grade Sellstrom Welding Helmets.**
2. **Adjustable Vulcoid Headgear with genuine top grain hatters leather forehead, cushion held in place by snap fasteners.**
3. **Exclusive plastic knobs at back and sides insure easy adjustment to proper size for a perfect fit.**
4. **Helmet held in any position by easily adjusted tension springs on sides of helmet.**
5. **Standard size window 2" x 4¼", which is Federal specification; special patented Sellstrom lens retainer.**

Order a sample helmet for "on the job" test purpose

Mr. Dealer: Order a few of these new helmets. Because of the modern design and efficient construction, this No. 243 Helmet should be very popular for many years to come.

Mr. Manufacturer: This is a brand new number. If your dealer has not had an opportunity to stock this helmet, order one shipped direct from the factory. We will gladly bill through any designated dealer.

sellstrom

MANUFACTURING COMPANY

626 N. Aberdeen St. Chicago 22, Ill.

From the Patent Office

International Nickel Gets Patent on Ductile Cast Iron

PATENTS on ductile cast iron were recently granted (see below) to the International Nickel Co., Inc. The new material is claimed to combine the processing advantages of cast iron, such as fluidity, castability and machinability with the product advantages of steel.

Essential feature of the new iron is the introduction and retention by the molten metal under treatment of a small amount of magnesium. This produces a new graphite structure which is in the form of spheroids or compacted particles. Due to the elimination of a substantial amount of the usual weakening flake graphite, the new iron is said to have high tensile strength, elastic modulus, yield strength and toughness.

* * *

Cast Ferrous Alloy

2,485,760. KEITH DWIGHT MILLIS, Rahway, ALBERT PAUL GAGNEBIN, Red Bank and NORMAN BODEN PILLING, Westfield, N. J. Assigned to The International Nickel Co., Inc., New York City. Filed Nov. 21, 1947. Granted Oct. 25, 1949.

A cast iron containing uncombined carbon and a small but effective amount up to less than about 0.4% of magnesium sufficient to control the occurrence of uncombined carbon as substantially spheroid particles. The cast iron without magnesium has the composition of gray cast iron normally containing uncombined carbon in the form of flakes.

* * *

Improved Gray Cast Iron

2,485,761. KEITH DWIGHT MILLIS, Rahway, ALBERT PAUL GAGNEBIN, Red Bank and NORMAN BODEN PILLING, Westfield, N. J. Assigned to The International Nickel Co., Inc., New York City. Filed March 20, 1948. Granted Oct. 25, 1949.

As an article of manufacture, a casting comprised of a gray cast iron containing about 2.5 to 4% carbon, about 1.5 to 4.5% silicon, about 0.01 to 2.5% manganese, at least 0.02% and up to 0.04 magnesium and the balance essentially iron. The gray cast iron is characterized by a microstructure containing at least 75% of the graphite in a compacted flake form.

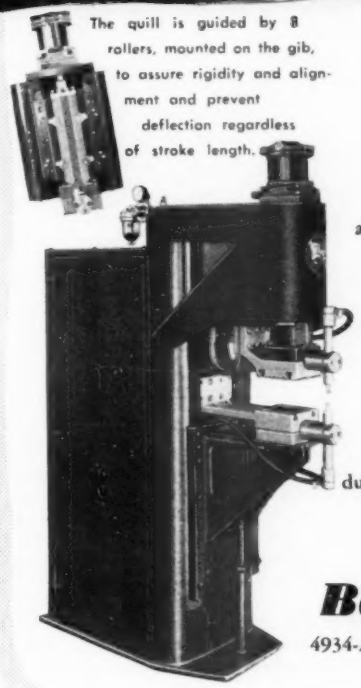
* * *

Stud for Welding

2,477,765. TED NELSON, San Leandro, Calif. Assigned to Morton Gregory Corp., Detroit. Filed Dec. 21, 1944. Granted Aug. 2, 1949.

A welding stud comprises a cylindrical head for welding to another body and a cylindrical shank for holding the head in the chuck of a welding implement. A conical neck is frangibly connected to the head at its small end.

NEW Banner Press Type Welder



The quill is guided by 8 rollers, mounted on the gib, to assure rigidity and alignment and prevent deflection regardless of stroke length.

THIS new Press Type Projection and Spot Welder combines the most modern engineering developments in design and construction to provide performance superior to any unit presently available. It is big and husky with a heavy structural steel frame to withstand heavy-duty service. Unique, high capacity transformer is equipped with 8 stage, series parallel heat selector switch. Air line equipment mounted at top for easy access. Head completely shrouded from dust and dirt. Many other extra features. Available in 50-75-150 KVA. Send for full details.

Banner Mfg. Co.

4934-A N. 29th St. Milwaukee, Wis.

Photologue-------FOR WELDING CATALOG SERVICE

Customers of Photologue comment on the cooperation received and the individual approach given to the compilation of each catalog.

Photologue Catalogs are compiled to . . . represent clearly your merchandise to the welding trade . . . advertise your products to regular and potential customers . . . sell your products economically.

Photologue Publishing Co.

CATALOG PUBLISHERS

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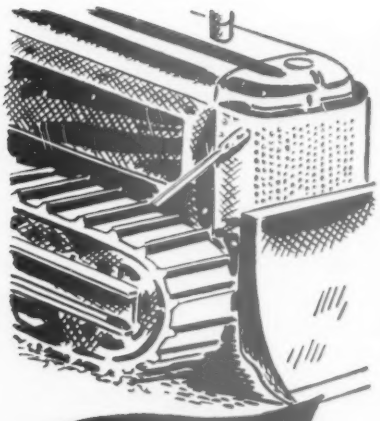

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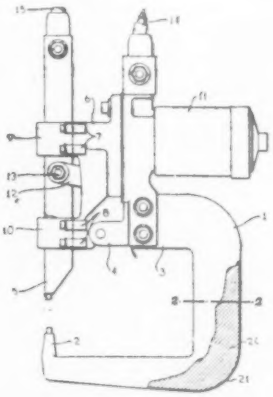
Copper-Coated R-W Yoke

2,479,053. COMFORT A. ADAMS, Philadelphia, Pa. Assigned to The Budd Co., Philadelphia. Filed June 22, 1945. Granted Aug. 16, 1949.

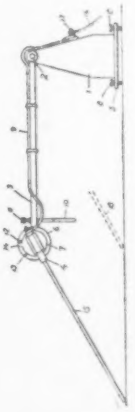


Patent covers a yoke for spot welding made of a metal core element and a metal surface having less electrical resistance than the core. The surface completely encloses the core and the volume of the surface in cross-section is less than that of the core. The thickness of the surface element lies within a range of 0.4 to 0.8 of the skin effect depth for 60 cycles current frequency.

* * *

Electric Arc Apparatus

2,477,906. NILS GUSTAV SMITH, Goteborg, Sweden. Assigned to Elektriska Svetsningsaktiebolaget, Goteborg, Sweden. Filed Feb. 16, 1948. Granted Aug. 2, 1949.



Patent applies to a mechanism for arc welding seams with rod-shaped coated electrodes. The mechanism includes a carrier member, a guide for the carrier, an electrode holder, a joint for connecting the holder to the carrier to allow rotation in a plane through the seam to be welded and stop means for opposing such rotation. Stop means are included for stopping the movement of the carrier towards the work when only a short length of electrode remains.

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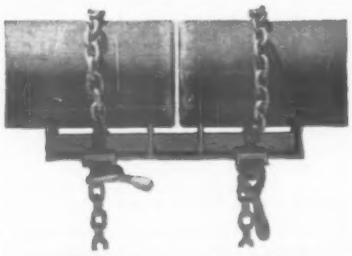

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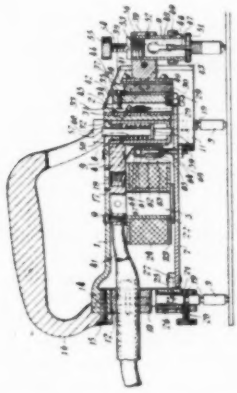
744 Broad St., Newark 2, N. J.

Stud Welding Device

2,475,907. Bruce Martin, Chatham, England. Filed Sept. 11, 1945. In Great Britain Sept. 14, 1944. Granted July 12, 1949.

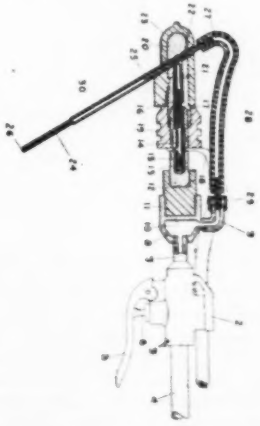


This recently patented stud welder consists of a housing, an electro magnet, an armature across the core of the magnet adapted for limited movement towards and away from the core and a spring acting upon the armature to oppose the force of the magnet. Outside the housing is a carrier and chuck for holding the stud to be welded at right angles to the work surface. The carrier is connected to the armature to receive movement toward and away from the work. The control of the welding circuit contains a switch device which is maintained closed by the armature when the latter is within a specified distance from the magnet core.

* * *

Cutting Torch

2,475,595. Roscoe C. Hunter, United States Navy, Holden, Utah. Filed June 13, 1945. Granted July 12, 1949.



A newly patented cutting torch utilizes a hollow electrode to which current is carried by a plunger. An electrically conducting head has a bore portion engaged with the plunger and has an opening through it for receiving the electrode. The plunger extends into the opening and holds the electrode. Separate hose means feed oxygen to the electrode.

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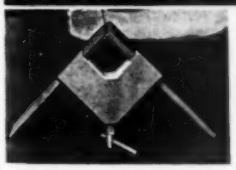

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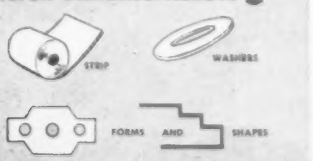

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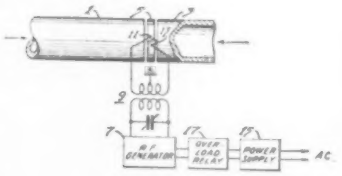
Welding by Induced Heat

2,478,640. Wesley M. Roberds, Collingwood, N. J. Assigned to Radio Corp. of America. Filed June 14, 1946. Granted Aug. 9, 1949.

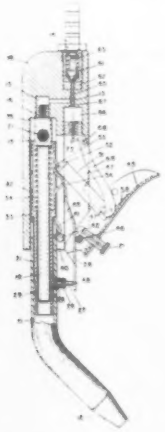


Patent applies to the method of joining opposed spaced edges of conductive workpieces by radio frequency current induced in them. The induction heating applicators are electrically conductive material which will unite with the material of the workpieces. They are formed in a split ring conforming in size and shape with the edges. The applicators are placed between the edges to be joined and radio frequency currents are applied to heat them. The adjacent edges of the workpieces are heated as well. The workpieces are then pressed against the applicator to cause it to unite with them and become a permanent part of them.

* * *

Gas Torch

2,477,917. Edward D. Wilson, Portland, Ore. Filed Sept. 17, 1945. Granted Aug. 2, 1949.



A new gas torch has a friction ignition device mounted next to the handle. The ignition device consists of a flint and abrasive elements which have a space between them leading to the inflammable gas passage of the torch. One of the abrasive elements is mounted for relative movement with respect to the other and is spring loaded. A lever is provided to move the element from one limit position to another. A leaf spring is engageable by the lever and is operative when the lever is in the second limit position. It applies pressure to the flint to urge it into frictional engagement with the abrasive element during return movement of the movable element.

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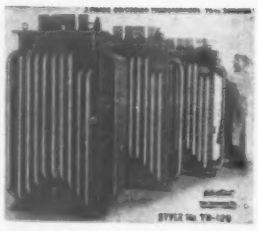

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CHAS. EISLER, Pres.
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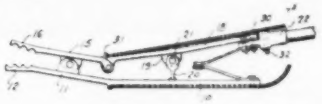
Electrode Holder

2,479,127. George P. Loucks, Toledo, O. Filed Aug. 7, 1949. Granted Aug. 16, 1949.

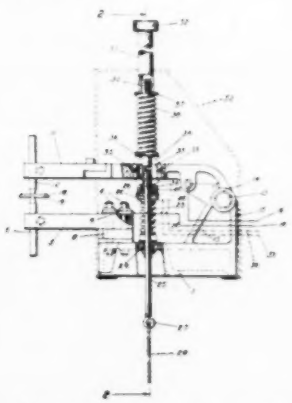


Patent pertains to an electrode holder having a rigid metal arm with an electrode-engaging jaw at one end. A shorter metal link has at its outer end a jaw to work with the first jaw. Between the ends of the short link arm is a pivotal mounting connecting it to the rigid arm. A second link arm is pivoted to the inner end of the first link arm. Still another pivotal mounting is arranged between the ends of the second link arm connecting it to the rigid arm. These mountings cooperate to form a toggle to positively maintain the jaws in either open or closed position. A switch is connected to the arms for opening and closing when the jaws open and close.

* * *

Spot Welding Mechanism

2,474,816. Rufus L. Briggs, Melrose, Mass. Assigned to Raytheon Mfg. Co., Newton, Mass. Filed Oct. 8, 1946. Granted July 5, 1949.



In this newly patented spot welding machine, pressure-exerting members go to work when the two electrodes contact the workpiece. A specific pressure is applied by control means whereupon welding current is sent through the workpiece. Pressures may be pre-selected.

* * *

Welding Inspection Method

2,475,596. John W. Dawson, West Newton, Mass. Assigned to Raytheon Mfg. Co., Newton, Mass. Filed Aug. 13, 1945. Granted July 12, 1949.

This patented method of examining welds consists of placing a thin film of material having different transparency to X-rays than material composing the workpieces between the two pieces before welding. When the surfaces are welded the areas at which complete fusion takes place have a substantially different transparency to X-rays than the areas which fail to fuse. Thus, when X-rays are sent through the weld they produce a well-defined image of unfused areas.

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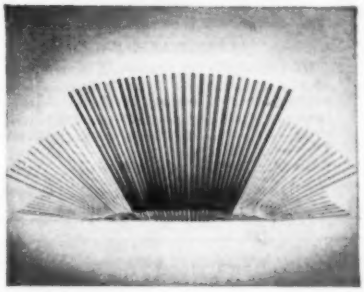

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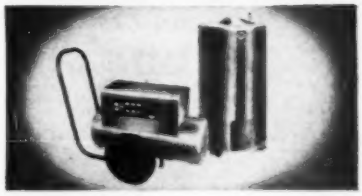

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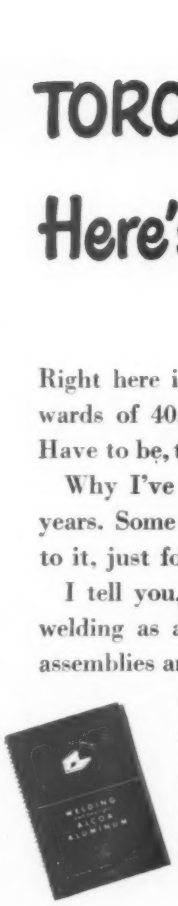
Right here in Alcoa's job shop we've welded upwards of 40,000 kettles. Good, tight seams, too. Have to be, to take the beating a steam kettle gets.

Why I've been welding aluminum over twenty years. Some of it up to one inch thick. No trick to it, just follow the simple procedures.

I tell you, manufacturers who don't investigate welding as an economical way to join aluminum assemblies are missing a bet. Especially when most of the information you need is in the free book, "Welding Alcoa Aluminum". Ask your nearby Alcoa Sales Office for a copy, or write ALUMINUM COMPANY OF AMERICA, 1751L Gulf Building, Pittsburgh 19, Pennsylvania.



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ALCOA ALUMINUM ®

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"Here are Some HARD Facts about HARD Facing that will make Money for You"

THE COLMONOY SPRAYWELD PROCESS

"Look at this actual comparison test between hand welding and Colmonoy Spraywelding. Believe it or not, the sleeve I'm pointing to was sprayed and fused in only *20* minutes. It took *180* minutes to hand weld the other sleeve. Where Spraywelding used only 11 ounces of Colmonoy No. 6 Powder, hand welding took 32 ounces of welding rod. With Spraywelding you need to remove only .010" of grinding stock for finishing; with hand welding .100". Hard facts prove that Spraywelding with Colmonoy No. 6 means big savings to you. Colmonoy increases (from 5 to 20 times) the life of parts subject to wear and corrosion."

Other Important Facts to Remember!

- ★ Deposit fused to base metal as in welding
- ★ No porosity or pinholes
- ★ Close tolerances to .010"
- ★ Quick and easy application
- ★ Low cost

At Your Service!

Write for catalog and other fully informative literature.

The Sprayweld process and Colmonoy No. 6 give long product life and long profits!

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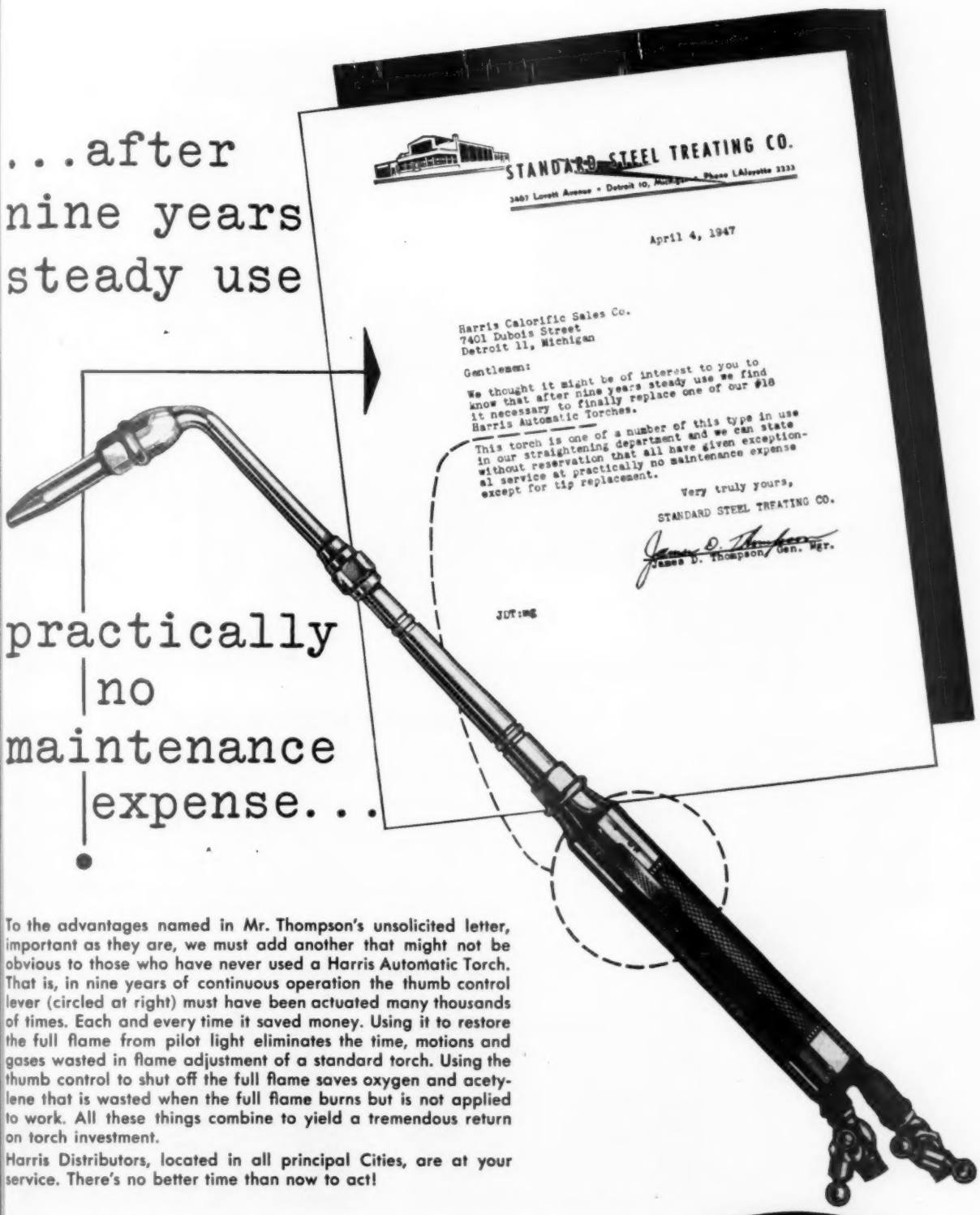
HARD FACING ALLOYS

19345 John R. Street **Detroit 3, Michigan**

...after nine years steady use

practically no maintenance expense...


STANDARD STEEL TREATING CO.
3487 Lovett Avenue • Detroit 10, Michigan • Phone LAfayette 3333
April 4, 1947
Harris Calorific Sales Co.
7401 Dubois Street
Detroit 11, Michigan
Gentlemen:
We thought it might be of interest to you to know that after nine years steady use we find it necessary to finally replace one of our #18 Harris Automatic Torches.
This torch is one of a number of this type in use in our straightening department and we can state without reservation that all have given exceptional service at practically no maintenance expense except for tip replacement.
Very truly yours,
STANDARD STEEL TREATING CO.
James D. Thompson, Gen. Mgr.
JDT:MG

To the advantages named in Mr. Thompson's unsolicited letter, important as they are, we must add another that might not be obvious to those who have never used a Harris Automatic Torch. That is, in nine years of continuous operation the thumb control lever (circled at right) must have been actuated many thousands of times. Each and every time it saved money. Using it to restore the full flame from pilot light eliminates the time, motions and gases wasted in flame adjustment of a standard torch. Using the thumb control to shut off the full flame saves oxygen and acetylene that is wasted when the full flame burns but is not applied to work. All these things combine to yield a tremendous return on torch investment.

Harris Distributors, located in all principal Cities, are at your service. There's no better time than now to act!

THE HARRIS CALORIFIC COMPANY

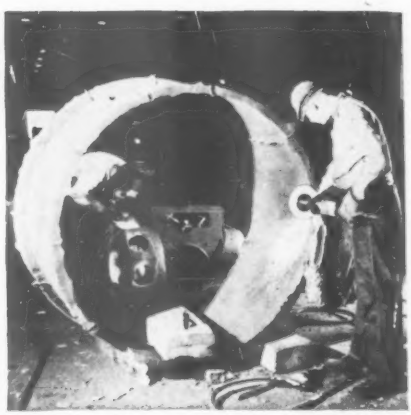
Cleveland 2, Ohio

HARRIS

SERVING THE METAL INDUSTRY SINCE 1905

4

This WD-44 400-amp welder is a primary maintenance tool in the main generating station of a Massachusetts power company. And maintenance is simple and inexpensive on all G-E welders.

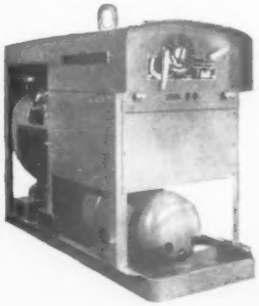


5

Plenty of heavy usage is the regular diet of this WD-43 300-amp welder in a New England foundry, and it's always ready for more; dependable service over a long "life-span" is one of its big features.

for 5 welding jobs

(and many more)

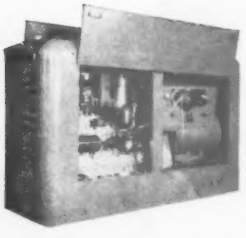


200-amp welder with Wisconsin air-cooled engine and V-belt drive; welding generator and control is identical to WD-42 motor-generator set. Also available with Hercules *liquid-cooled* engine. Note the auxiliary power take-off (d-c) for 110-v lights and universal tools. Approximate weight—1000 lbs.

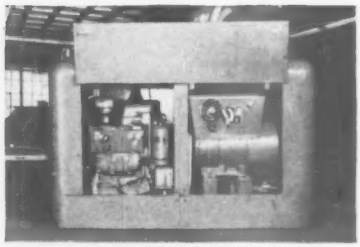
...engine-driven welders? Certainly!

In addition to the same advantages and welding characteristics of the motor-generator welders, G-E engine-driven welders also provide:

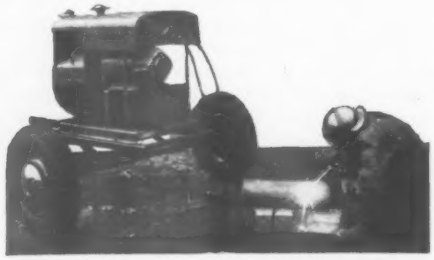
1. Easy, dependable operation with performance-proved engines.
2. Light weight, and a variety of trailer models, for ready portability.
3. G.E.'s "slow-down" control saves gas, and wear and tear by slowing the engine to idling speed when not actually welding; engine speeds up automatically the instant the arc is struck, with a precision governor to prevent overspeeding.
4. Engines operate at *constant* optimum speed; all welding control is electrical.
5. Muffled exhaust with rain cap to exclude water.



300- and 400-amp models are available with either 6-cylinder Chrysler gas-engine drive, or with. . .



. . . GM or Caterpillar diesel-engine drive. Electric starting is furnished on all 300- and 400-amp models, both gas and diesel, at no extra cost.



For light-duty welding this WD-3200BG 200-amp machine with air-cooled engine-drive is ideal; weighs only 660 pounds (net) and is only 26" wide.

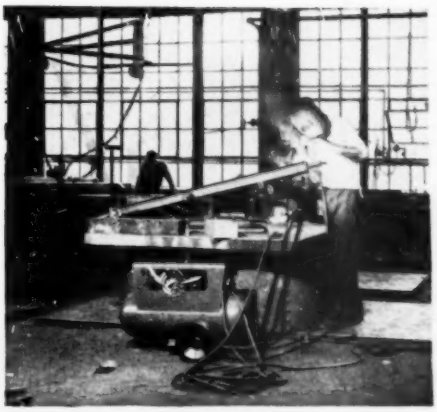
You can put your confidence in— GENERAL ELECTRIC

231-9

ARC WELDERS • ELECTRODES • ACCESSORIES • RENEWAL PARTS

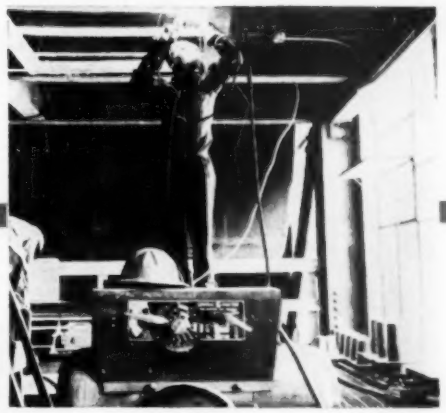
5 big G-E advantages

1



This G-E WD-42 200-amp welder is in constant use on a great variety of jobs in this welding job shop. Like the 300- and 400-amp models, it gives superior welding performance with a forceful, easily controlled arc over a wide current range.

2



Here's one of 14 G-E d-c welders employed on a big power-plant construction job. Note the single-dial, dual control—it's standard on all three models. The handy electrode selector makes desired current settings easy, and gives complete flexibility.

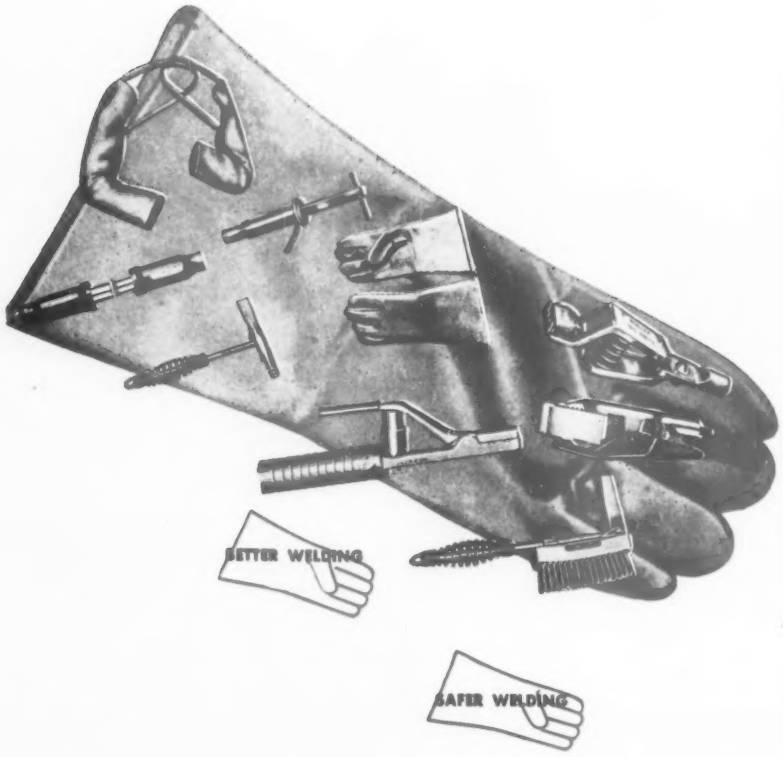
3

The 200-amp WD-42 welder is ideal for welding with low current on sheet-metal and other thin gauge materials. All WD-40 welders offer a 50% savings in size and weight over heavy, old-fashioned welders—thanks to efficient functional design, which has eliminated "dead-weight."

If you're welding with direct-current, General Electric D-C arc welders are designed with *you* in mind. Regardless of the job, they bring you:

1) Superior welding performance
2) Single-dial, dual control
3) 50% savings in size and weight
4) Easy, inexpensive maintenance
5) Dependable service over long "life span"

And finally, *G-E arc welder prices are now at their lowest point in ten years,* SO BY BUYING NOW YOU SAVE MONEY on the original purchase, welding operations, and maintenance. Your General Electric Welding Distributor can deliver just the model you want right from his own stock; don't put it off . . . call or write him today! *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*



ACCESSORIES TO THE PERFECT WELD

More and more fabricators—sold on the smooth performance of M & T's "SELECT 70"* group of arc welding electrodes and the M & T new, up-to-the-minute AC and DC arc welders—are specifying M & T accessories for all-around assurance of top-notch welding.

Accessories such as top quality holders, shields, connectors, cleaning tools and protective clothing boost speed, safety and savings on all arc welding, whatever the job.

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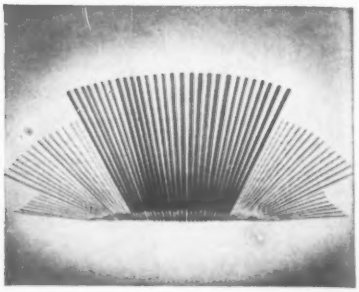
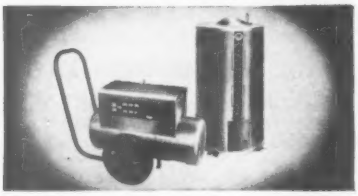


DESCRIPTIVE literature covering mild steel, low alloy and special steel, stainless steel, hard surfacing and build up and other special electrodes is available to those requesting full information on M & T's "SELECT 70"— seventy electrodes designed to cover all arc welding requirements—AC or DC, all-position or downhand work welding of mild steel, low alloys and stainless steels as well as hard surfacing and building up of worn parts.

Literature is brief but comprehensive, covering specifications, properties and applications for each electrode. Copies available on request received on company letterhead. Address Metal and Thermit Corporation, 120 Broadway, New York 5, N. Y.

NEW ARC WELDERS BOOST AC and DC PERFORMANCE



FASTER welding, better quality welds, lower power costs, and simplified maintenance are furnished by a new line of AC and DC arc welders introduced by Metal and Thermit Corporation.

Built-in capacitors for high power factor, wide current range for full rated output—and fingertip, stepless current control for precise current setting are featured in the AC units. Available in 150 to 500 amp models for manual arc welding, additional models for inert arc and automatic welding.

Full capacity, rugged duty DC arc welders are compact, light in weight—half the size and half the weight of older types—and are equipped with simplified current control, automatic electrode selector. Furnished in 150 to 400 amp sets—motor driven, engine driven or belt-drive.

Descriptive folder gives full particulars. Address Metal and Thermit Corporation, 120 Broadway, New York 5, N. Y.

AC or DC?

The Job Determines the Type of Welder

By Burke Porter, Chief Engineer
C. O. Porter Machinery Company, Grand Rapids, Michigan

Burke Porter

Extensive changeover of our woodworking machines from castings to weldments has made advisable the construction of a new plant devoted entirely to the fabrication of our machine parts. In equipping this new welding shop, we have given considerable thought to the types of arc welders to be installed.

Should they be AC or DC?

The advice of the local Lincoln Welding Engineer seemed sound—*install both types of welders and use the type which is best suited to each job.*

Accordingly, we installed three 400-amp. Lincoln DC "Shield-Arcs" and two 500-amp. Lincoln AC "Fleetwelders."

For the bulk of our work, DC is preferable. Much of it involves outside corner welds, all-position joints, intermittent beads, light-gauge material, tubular members, and we often weld stainless steel.

On the other hand, in the welding of our bases, inside corner joints and boxed-in areas result in considerable arc blow. Under these conditions, we can use higher amperages and get faster welding and better quality with the AC welders.

In this problem of AC and DC welding, the unbiased recommendations of the Lincoln people are advantageous to us and our customers. It pays to apply the right type of welding to match the job.

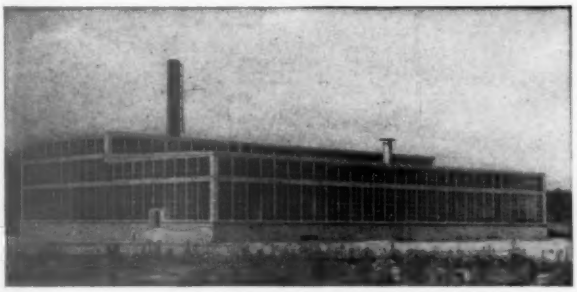


Fig. 1. New weldment plant of the Porter Machinery Co., evidence of the belief of this company in the superiority of welded steel for its products.

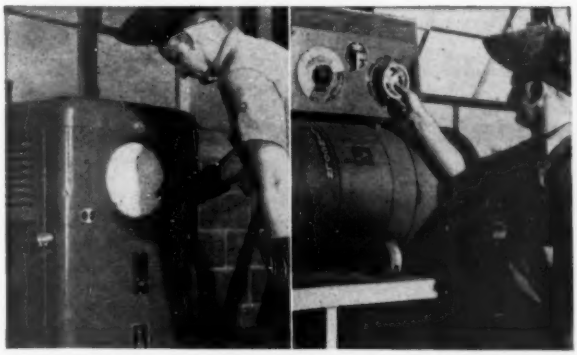


Fig 2. (Left) If arc blow is involved, the welder tackles the job with AC. (Right) If arc blow or very high currents are not involved, DC usually is best.

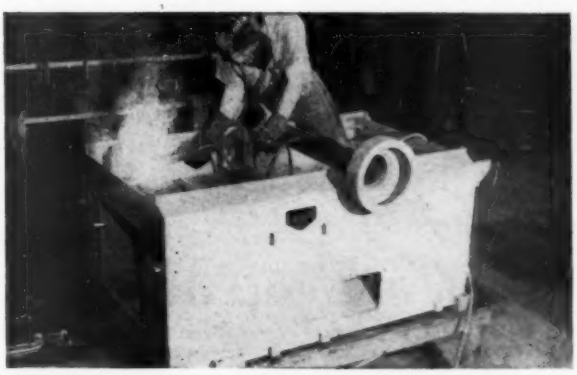


Fig. 3. Bases—where arc blow is severe—are welded with AC.

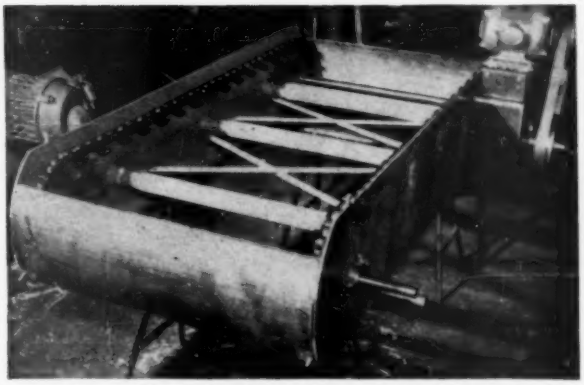


Fig. 4. Parts such as this frame are generally welded with DC.

The above is published by **THE LINCOLN ELECTRIC COMPANY** *in the interests of progress.*
Write for DC "Shield-Arc" Bul. 459 and AC "Fleetwelders" Bul. 366. The Lincoln Electric Company, Dept. 712, Cleveland 1, Ohio.
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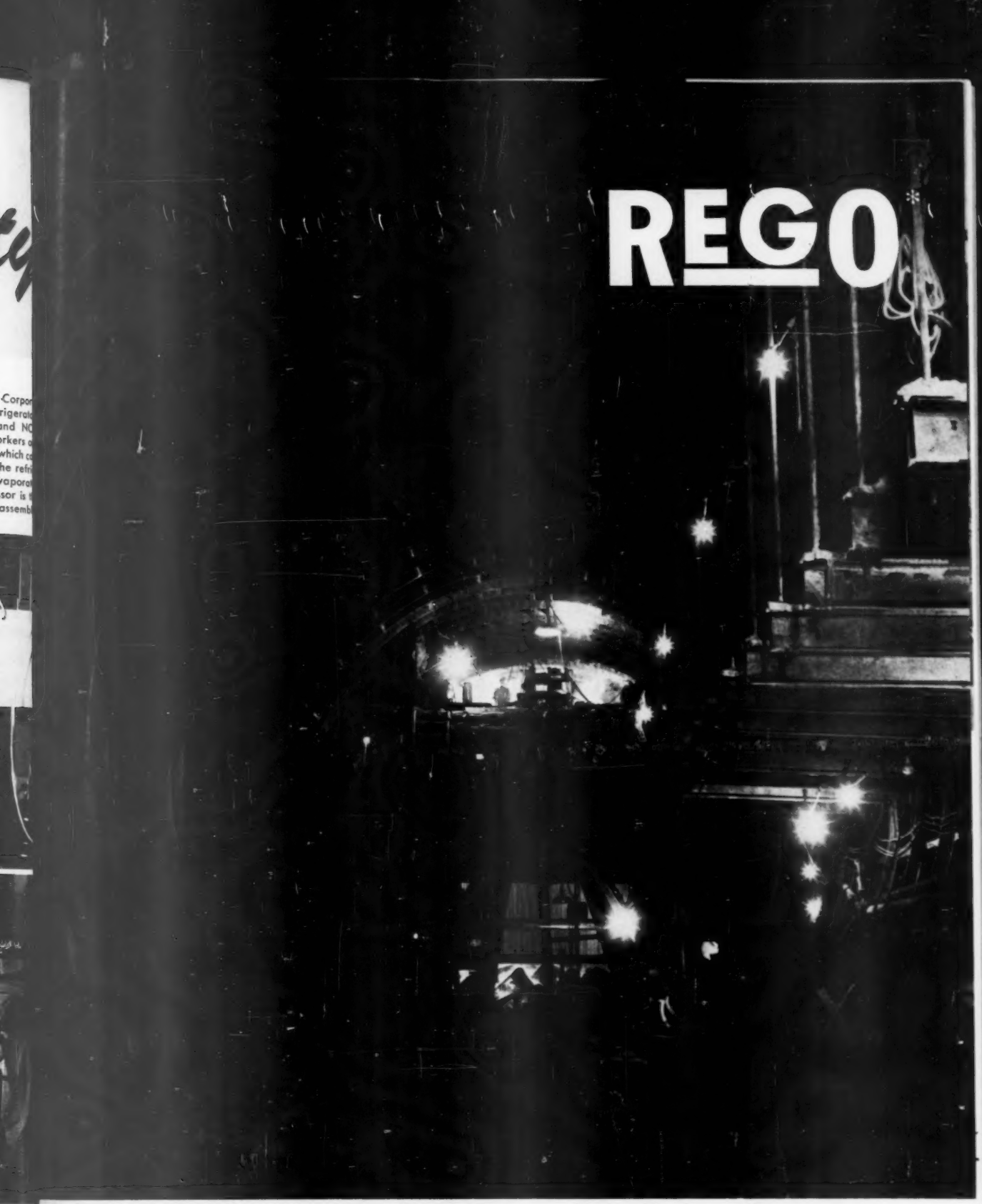
RELY ON NCG

On the production line at Nash-Kelvinator Corpor tion's Detroit plant, where Kelvinator refrigerat are assembled, Rego welding torches and NC oxygen and acetylene are used. Here workers a silver-soldering joints in the copper tubing which ca ries the chemical refrigerant to complete the refri erating cycle from the compressor to the evapora and back to the compressor. The compressor is t black dome-type unit at the base of the assemb

At the Homestead Valve Mfg. Co.'s new No. 3 plan at Coraopolis, Pa., production on "Hypressure Jennys" is kept stepping along with an NCG pipe-line system fed from bulk delivery of NCG oxygen and acetylene. This modern welding set-up puts everything at the workers' fingertips for faster, more economical out put. Here are seen the rapid assembling of steam coils for the famous "Jenny" steam cleaning ma chine, in which both gas and arc welding are used.



NCG oxygen and acetylene were used to tackle one of the most spectacular dismantling jobs in the New York area—the cutting out of four mammoth tunnel shields used in constructing the Triborough Bridge and Tunnel Authority's new Brooklyn-Battery traffic tunnel—the longest under-water highway in this hemisphere—nearly two miles long. Both contractors—Mason & Hanger Co., Inc., New York, and George H. Flinn Corporation, New York—have been users of NCG gases exclusively for many years. The shields, each 31′ 8″ in diameter and built of 1¼″ plates, head up the tunneling operations, providing protection for the miners, who work in front of the shields. The twin traffic tubes from the Manhattan shore, and the two from the Brooklyn shore, met near the ventilation building caisson 125-ft. below New York harbor at a point just north of Governors Island. It took a month of steady cutting to dismantle each of the four shields. NCG portable banks were used to insure reliable flow of gases in ample volume.

The weight's in the load and not in the truck when frames, body panels, fenders, wheels and other truck structural parts are made of N-A-X HIGH-TENSILE. And while affording weight savings of up to 25% in section, the high physical properties of N-A-X HIGH-TENSILE insure superior strength and increased resistance to fatigue, corrosion, abrasion and denting.

This decrease in deadweight decreases on-the-job expenses, too. Trucks built with N-A-X HIGH-TENSILE consume less gasoline . . . require less maintenance . . . give longer service. And the excellent formability, weldability, and fine surface texture of N-A-X HIGH-TENSILE mean that you build them better, with no added fabricating problems.

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Ask for complete details. Check for yourself the high quality construction that lets the Hobart "Bantam Champ" fight your battle for lower arc welding costs and bigger profits—with less investment. Get the full story, without obligation, by mailing the coupon today. **Hobart Brothers Co., Box U-129, Troy, Ohio, U. S. A.** *"One of the World's Largest Builders of Arc Welders"*

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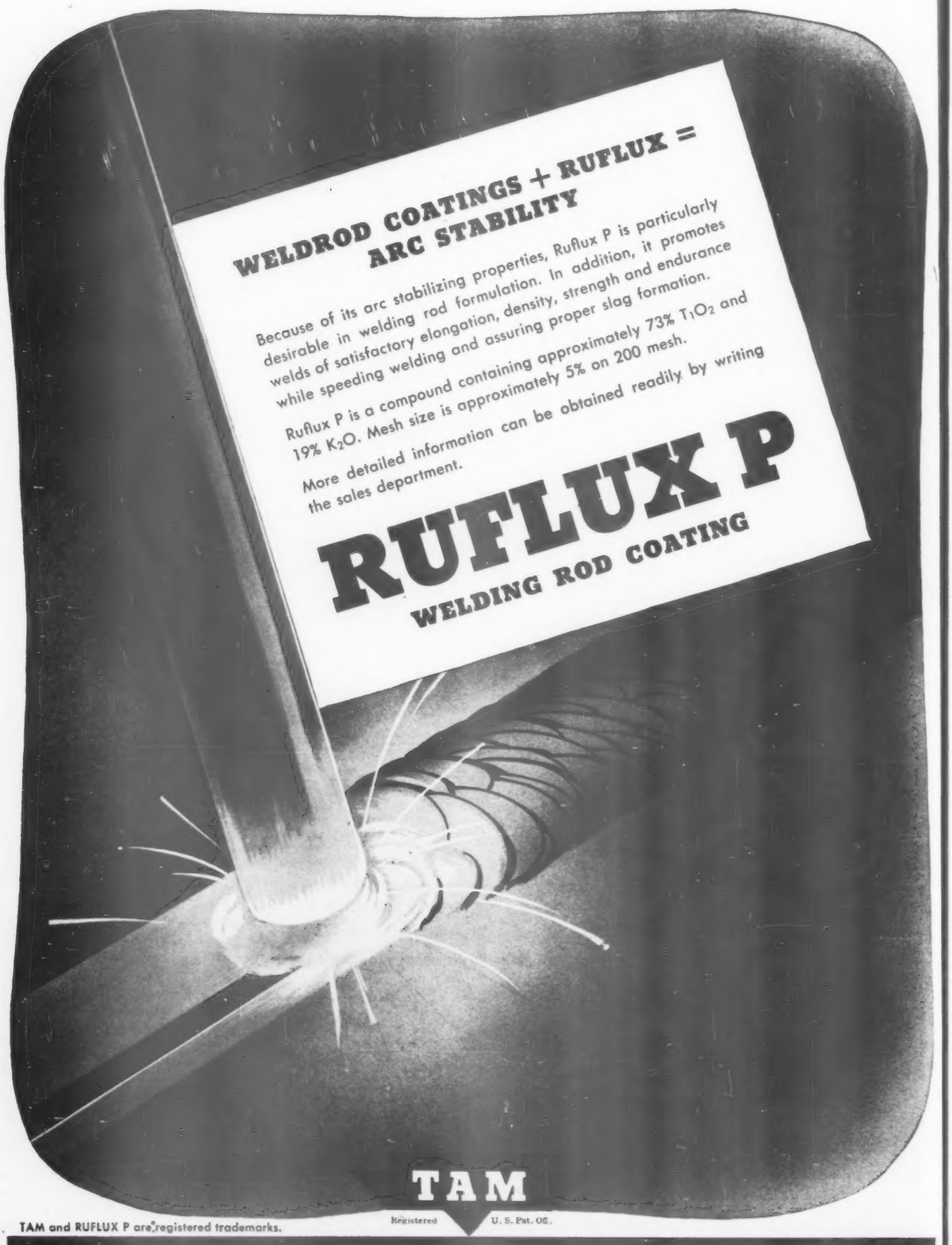
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The reason is sound. It's because bronze, when molten, alloys readily with the surface of almost any metal brought to a cherry-red heat. Low-temperature welding minimizes the residual stresses that often cause distortion and cracking.

Why take a risk when you don't have to? Use Tobin Bronze, ANACONDA 997 Low Fuming Bronze, or other ANACONDA Welding Rods for a reliable, fast weld that's also easy to machine. Made by The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 49153

24 Pages of Welding Rod Facts!

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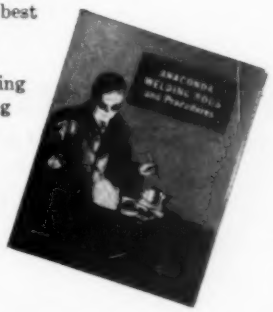

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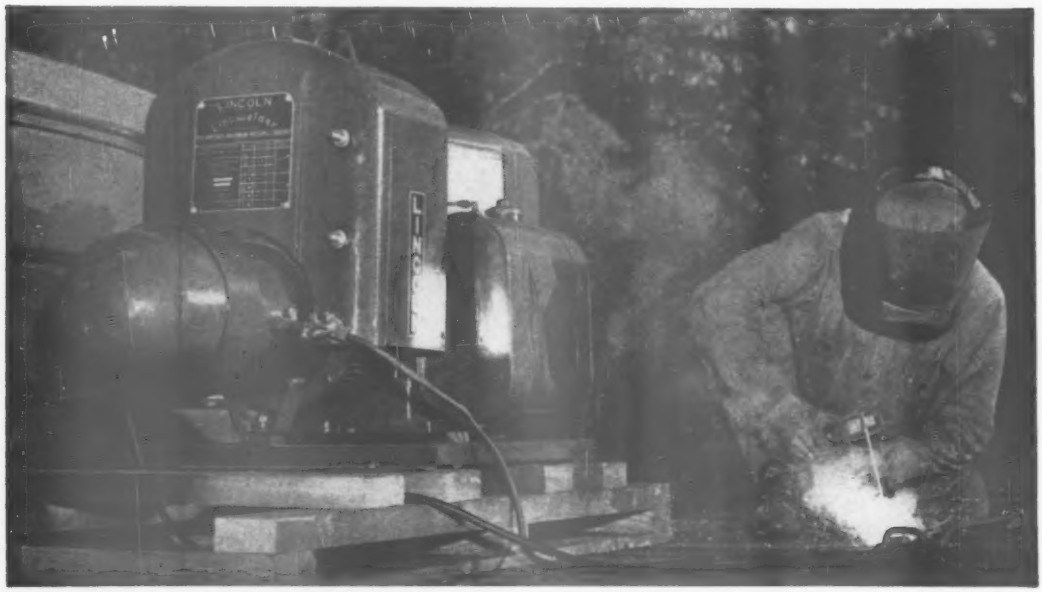

Compact, lightweight, the Lincoln DC-180 is ideal for field welding.

LINCOLN DC-180. Here's an amazing value in arc welders to simplify your welding and cut costs . . . an engine driven welder priced at only $375.00, *less than that often charged for a welding generator alone.*

Welding range is 20 to 220 amps., ample for the bulk of today's field welding and hardfacing work. Surprisingly economical on gas and oil. Powered by a dependable 13 HP. air-cooled engine with special controls for governing engine speed. No anti-freeze worries in the winter. Valuable as an extra pick-up unit. Weighs only 520 lbs. . . . can be mounted easily in any light delivery truck. Saves the cost and bother of moving heavier equipment on many jobs.

LINCOLN DC-200. Built for slightly heavier welding than the DC-180 arc welder. Price . . . only $450.00. Current range 30 to 250 amps. Has continuous current control for accurately setting the welding current. Weighs only 660 lbs. Powered by a 22 HP. air-cooled engine with automatic engine speed control. Can be provided with two-wheeled undercarriage for highway towing at slight extra cost.

Full details are available in free bulletins. Fill out and mail the attached coupon or write The Lincoln Electric Company, Dept. 713, Cleveland 1, Ohio.

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CLEVELAND 1, OHIO

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Send full details at once on the ☐ DC-180 Engine Driven Welder, ☐ DC-200 Engine Driven Welder.

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Name of Company_____

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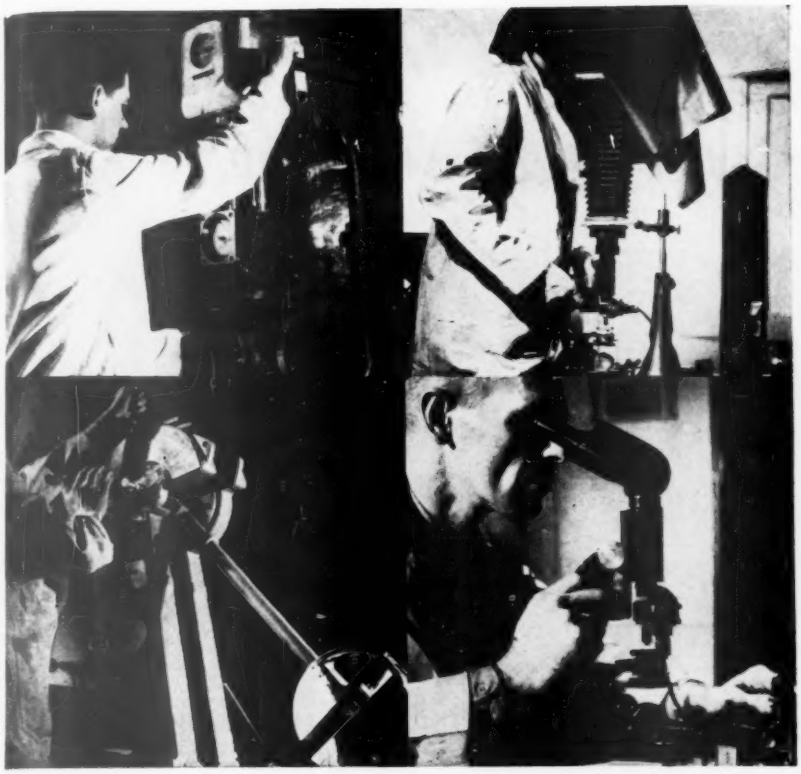

Raw material control means better Tube-Turn welding fittings

What's a piece of steel made of?

THE quality of a finished product is largely dependent on the quality of the raw material from which it is made. That's why Tube Turns' laboratory technicians thoroughly test every lot of seamless steel tubing received in the Tube Turns, Inc. plant.

Answers to that important question —*What's a piece of steel made of?*— are determined in two ways. First, by chemical tests that disclose the exact percentage of the various elements present in the steel. And, second, by physical tests to determine the steel's tensile strength, yield strength, and elongation. Unless the steel measures up in all respects, the entire lot is rejected.

At the end of these tests, not only is the chemical composition of the steel known, but an accurate appraisal of its metallurgical and physical characteristics has been made. And these facts are filed by the laboratory control number rolled into each fitting to identify it permanently with the lot of steel from which it was made.

This rigid control over raw material is your assurance of basic quality in the Tube-Turn welding fittings you buy. Modern equipment in the hands of skilled technicians permit only the best steel to be used for the manufacture of Tube-Turn products.

Remember, you can always bank on good service in good connections every time you specify "Tube-Turn."

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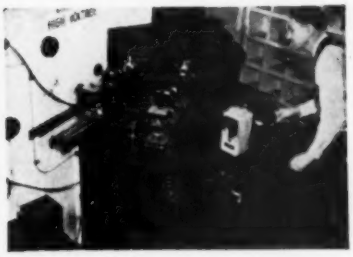
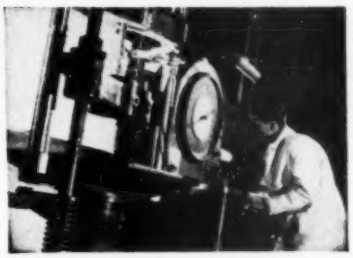
WELDING FITTINGS AND FLANGES

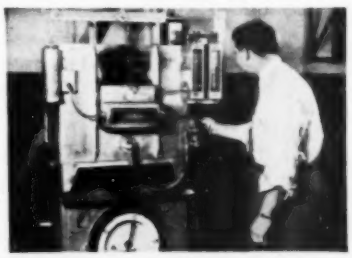


Foolproof chemical analysis of steel is made quickly and accurately on this Spectroscope, typical of the modern equipment used by Tube Turns, Inc. in the control of raw material.



Tensile strength of all seamless steel tubing is accurately measured on this machine, capable of exerting a force of 6,000 pounds. Yield strength and ductility are also checked here.

Periodic checks on the hardness of the steel are made with this Rockwell instrument to determine the strength, ductility, and machinability of the material. Brinell equipment is also used to check hardness.



Advance indication of what will happen to the steel during processing is determined with this electric furnace, one of a battery. Heat treatment to which the material will be subjected is duplicated here.

The First of Its Type —Still First in Efficiency—

A.O.Smith
Certified
AC-DC
MILD STEEL ELECTRODE
SW-15
A.W.S. Class E6013

Heil Company's 16-yard open-top "HEILINER SCRAPER," made to handle tough field assignments. Dependable welding assured with A. O. Smith SW-15 Electrodes.

A. O. Smith, originator of modern heavy-coated electrodes and many modern welding techniques, was also the pioneer in developing a Universal Type electrode of AWS Class #6013. A. O. Smith specially developed this electrode (SW-15) for high-speed welding in any position with either AC or DC current.

SW-15 electrode is the logical choice for tough field assignments that demand dependable welding. This electrode is particularly suitable for difficult operations such as field erection—or where, in the absence of close supervision, high-quality welds are desired and readily obtainable.

With a penetrating, easily directed arc, SW-15 produces unusually smooth welds with sound physical properties. Deposit efficiency is high. Spatter loss is at a minimum. Slag curls off by itself and gives a cleaner, faster weld with maximum economy.

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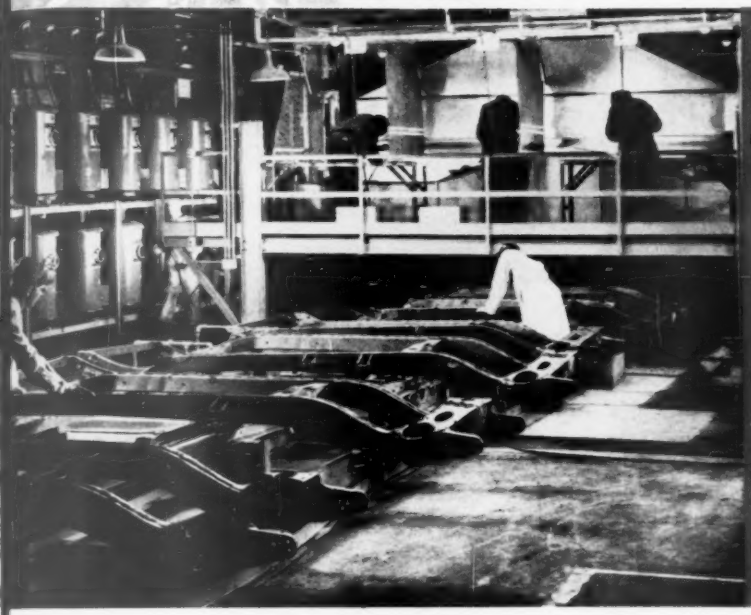

A.O.Smith HEAVY-DUTY AC WELDERS

A. O. Smith Heavy-Duty Welders take "roughing up" and really like it. Under even the most severe operating conditions, they stand up under treatment that punishes other machines.

Pictured here are A. O. Smith Heavy-Duty Welders in continuous operation on mass production of automotive frames at the A. O. Smith Corporation. A. O. Smith engineers designed this rugged machine for the tough welding jobs encountered in the production of thousands of A. O. Smith steel products. They needed a machine with a fast-starting arc for high-speed welding, and a machine to reduce down-time to a minimum. The result is an AC machine of clean design that produces an easy-to-strike arc, welds with a stable arc, and eliminates arc-blow.

Hundreds of thousands of operating hours every day, on tough welding assignments, have proved that the A. O. Smith AC Welder will stand up under service that punishes any other machine. Send the coupon for full details and specifications.

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AO 3080 Goggle

AO 404 A Duraweld Goggle

Here's the goggle that means better, faster laying of beads because it "blacks out" injurious light rays and protects against flying sparks and scale. Welders like the individual comfortable eyecups shaped to eye contours and particularly the wide angle vision that results from the low set of the eyecups. Special side shields do a twofold job of protecting and ventilating to reduce fogging. Form fitting bridge is comfortable, ball-chain type, insulated and quickly adjustable. One-piece, all rubber perspiration-resistant, easily adjusted headband. Available with Noviweld lenses, shades 3, 4, 5, 6, or 8 or with Noviweld-Didymium lenses.

Both Give Double Protection...

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AO 3080 Goggle

Calobar lenses (Regular Super Armorplate or 6 Curve Super Armorplate) in medium, dark or extra dark shades protect against flying particles as well as against hazards incidental to welding. Recommended for welders (under helmets), welders' helpers, furnace men, and others adjacent to electric welding. Also available with clear lenses for chipping, grinding, riveting. Other Features: Strong bridge and reinforcing bar covered with leather guard to protect against heat, foreign matter and stray light... insulated, perspiration-proof temples . . . soft leather side shields for comfortable, added protection.

Order these goggles from your nearest AO Safety Products Representative, specifying type of lens and shade.

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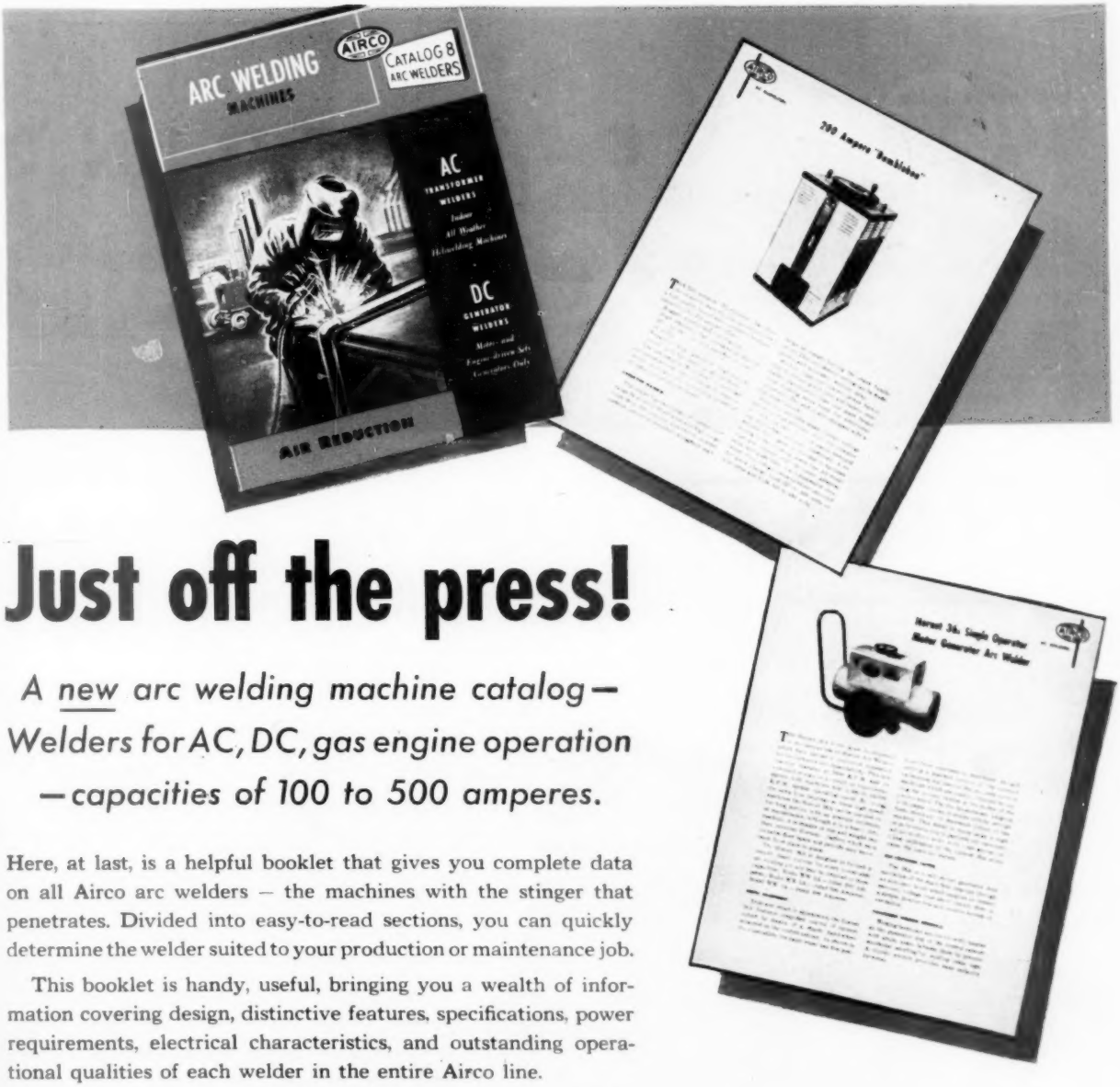

Just off the press!

A new arc welding machine catalog—
Welders for AC, DC, gas engine operation
—capacities of 100 to 500 amperes.

Here, at last, is a helpful booklet that gives you complete data on all Airco arc welders — the machines with the stinger that penetrates. Divided into easy-to-read sections, you can quickly determine the welder suited to your production or maintenance job.

This booklet is handy, useful, bringing you a wealth of information covering design, distinctive features, specifications, power requirements, electrical characteristics, and outstanding operational qualities of each welder in the entire Airco line.

To give you some idea of the amount of material covered by this definitive booklet, here are a few of the many welders covered.

- "Bumblebee" and MCT — Transformer AC Arc Welding Machines
- "Hornet" 36A and "Wasp" — DC Arc Welding Machines
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FIRST sample our improved Class E-6010 electrode

G.E.'s NEW W-22 ELECTRODE (AWS Class E6010) is a reverse polarity d-c rod that produces high-quality welds in *all* positions. Its steady, spray-type arc is easily controlled . . . with little spatter, and excellent penetration.

This electrode is ideal for vertical and overhead welding jobs where welds of excellent appearance, high tensile strength, high ductility, and good impact resistance are particularly important.

The new W-22 has already proved itself in production tests . . . such as that at the Vulcan Steel Tank Company at Tulsa, where it was used in welding tank heads or end covers 36" in diameter and ¼" thick. Note the good fusion and excellent appearance of the finished welds. Their Welding Superintendent reports this electrode has the most forceful yet easily controlled arc he has ever seen.

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SECOND ...new G-E welding electrode comparator

Here's all the electrode comparison information heretofore available only on large, unwieldy charts—condensed into a handy, pocket-sized slide-rule. Naturally, it includes all G-E electrodes—mild-steel, special alloys, low-hydrogen, stainless-steel, hard-surfacing, etc.; and it covers the standard electrodes of all principal manufacturers—all suitably keyed to AWS classification numbers. And it's easy to use . . . just set the rule, and read off the comparison data directly. You'll find it the handiest means of comparing electrodes you've ever come across.

Clip the coupon for your free copy of the new G-E welding electrode "Comparator."

And here's a special bonus! Mail the coupon today, and we'll also send you a copy of the brand new edition of the pocket-sized G-E Arc-welding Electrode Catalog!

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Mallory Heavy Duty KO Offset Holders with spring-loaded knockout plugs

The famous Mallory Heavy Duty KO Offset Holders have been greatly improved—*spring-loaded knock-out plugs have been added!*

Now you can eliminate the old bugaboo of a closed water supply caused by a knockout plug that did not return to position. In this new Mallory design, the spring-loaded knockout plug *automatically* returns to its original position thus guaranteeing a full water flow at all times. Full water flow insures longer tip life.

The metal parts of this new Mallory "first" are rust-proof and corrosion resistant. O-Rings in place of ordinary packing make the holder completely leak-proof. Laboratory tests prove that the holders will operate continuously and efficiently under water pressures far greater than encountered in normal usage.

Write today for complete details. Mallory engineers will be glad to work with you on your special welding problems.

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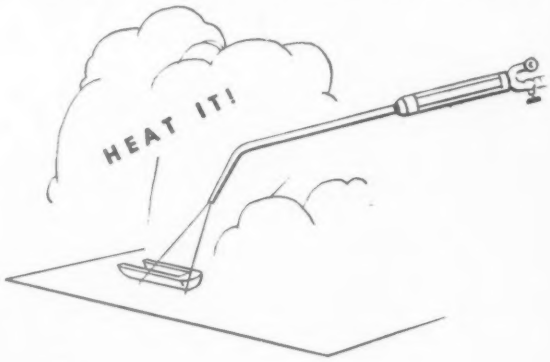
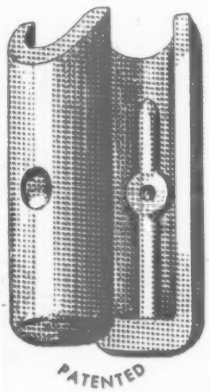
TWECO "SUPER-MEL" INSULATION

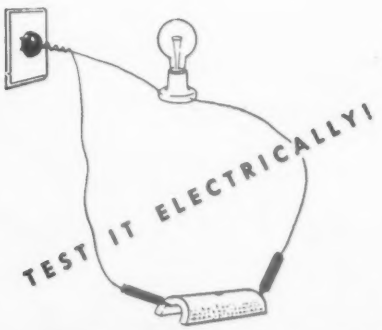
Stands abuse that ruins all other holder insulations on the market

Withstands greatest impact of all holder insulations on the market.

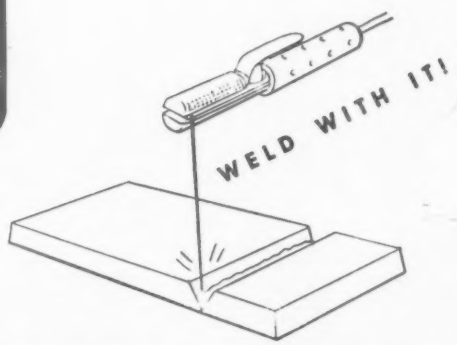


Will not carbon char even after 3 minute 6,200° F torch test.

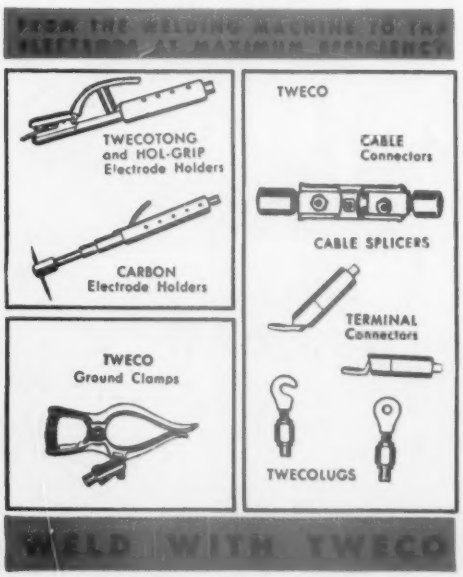




Insulation that continues to protect your weldor and machine *after* 9,000° F arc usage. Will not pass welding current.



Long lasting! Heat defying! Insulates perfectly after heavy duty that completely destroys other holder insulations.



Tweco "Super-Mel" insulation is the secret of the superior economy and efficiency of the popular Twecotong electrode holder. Like all Twecotong tip insulations, "Super-Mel" is quickly replaceable. Top and bottom jaw tip insulators are interchangeable and can be replaced with one stock item.

Laminated glass cloth, 22 layers impregnated and molded with "Super-Mel" resin binder, produces this amazing "Super-Mel" tip insulation. The tips are so rugged that even 80% arc time under hottest possible welding conditions will not destroy their efficiency. Their patented, close fitting design (keyed to the holder) withstands tremendous impact. They are so durable and long lasting that many welderies report 50% to 300% greater useful life.

Write for Twecolog #7 giving data and prices on the complete TWECO line of electrode holders, ground clamps and cable connections for electric welding.

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